Final
Master Work Plan
Atlantic Fleet Weapons Training Facility
Vieques Island, Puerto Rico

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the
LANTDIV CLEAN II Program
Contract No. N62470-95-D-6007
CTO-031

Prepared by

CH2MHILL

Tampa, Florida

September 6, 2001

Master Work Plan

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Introduction and Work Plan Contents

The U. S. Environmental Protection Agency (EPA) and the U.S. Navy (Navy) entered into a Consent Order on January 20, 2000, to address potential environmental contamination at the Atlantic Fleet Weapons Training Facility (AFWTF) on Vieques Island, Puerto Rico. As part of the Consent Order, the Navy is required to perform a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) to fully determine the nature and extent of any releases of hazardous wastes, solid wastes, and/or hazardous constituents from or at AFWTF.

In response to the requirements of Contract Task Order (CTO)-031, CH2M HILL has prepared a work plan for the RFI at AFWTF. The RFI addresses potential soil and groundwater contamination for nine of 12 identified Solid Waste Management Units (SWMUs) and three identified Areas of Concern (AOCs) at AFWTF. The remaining three identified SWMUs at AFWFT not addressed in this work plan are excluded from the corrective action requirements at AFWFT per section IV.7(d) of the Consent Order.

The work plan provides for submission of a draft, draft final, and final work plan; and consists of the following six plans:

- *Project Management Plan,* which contains a discussion of the project background, technical approach (including monitoring rationale), schedules, budget, personnel, and the overall management approach to the RFI
- *Master Quality Assurance Project Plan,* which documents the procedures to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented
- *Data Management Plan,* which documents and tracks investigation data and results
- *Health and Safety Plan,* which discusses the health and safety requirements for performing fieldwork at the sites
- *Master Investigation-Derived Waste Management Plan,* which provides guidance on handling and disposing of investigation-derived waste (IDW)
- *Community Relations Plan,* which outlines the public outreach activities planned for the project

Project Management Plan

Draft Final

Project Management Plan

Atlantic Fleet Weapons Training Facility
Vieques Island, Puerto Rico

Contract Task Order 031

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4350 W. Cypress Street
Suite 600
Tampa, FL 33607-4155

September 6, 2001

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List of Acronyms

AFWTF	Atlantic Fleet Weapons Training Facility
AOCs	Areas of Concern
ASTs	Aboveground fuel storage tanks
bls	Below land surface
CMS	Corrective Measures Study
CLP	Contract laboratory program
DOH	Department of Health
EDMS	Environmental data management system
EMA	Eastern Maneuver Area
EPA	U.S. Environmental Protection Agency
GIS	Geographic information system
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
IDW	Investigation-Derived Waste
IDWMP	IDW Management Plan
IM	Interim Measure
LANTDIV	Atlantic Division
MPRs	Monthly progress reports
msl	Mean sea level
NACIP	Navy Assessment and Control of Installation Pollutants
NASD	Naval Ammunition Support Detachment
NATO	North Atlantic Treaty Organization
NAVFACENGCOM	Naval Facilities Engineering Command
Navy	Department of the Navy
NFA	No Further Action
NFESC	Naval Facilities Engineering Services Center
NGFS	Naval gunfire support
NSRR	Naval Station Roosevelt Roads
OB	Open burn
OD	Open detonation
OP	Observation Post
PMP	Project management plan
PRASA	Puerto Rico Aqueduct and Sewer Authority
PREQB	Puerto Rico Environmental Quality Board
RCRA	Resource Conservation and Recovery Act of 1976
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAP	Sampling and Analysis Plan
SMP	Site Management Plan
SWMUs	Solid Waste Management Units

TC	Toxicity Characteristics
TCLP	Toxicity Characteristics Leaching Procedure
USGS	U.S. Geological Survey
UST	Underground storage tank
VSI	Visual site inspection

SECTION 1

Project Background

The project management plan (PMP) provides an overview and overall management approach to this Atlantic Fleet Weapons Training Facility (AFWTF) Phase I Resource Conservation and Recovery Act of 1976 (RCRA) Facility Investigation (RFI) project. The project management plan contains a discussion of the project background, facility description, project objectives, technical approach (including sampling rationale), personnel, and schedule.

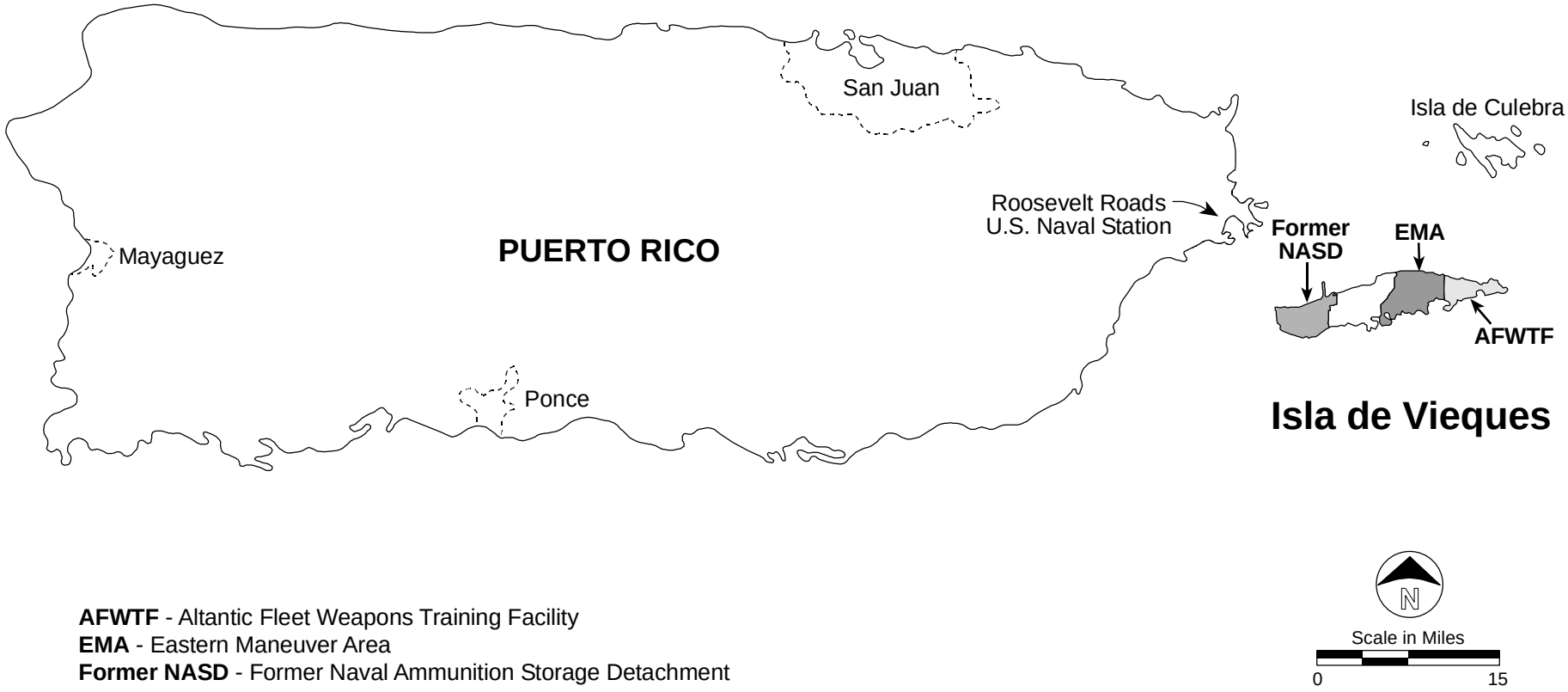
1.1 RFI Background

On January 20, 2000, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of the Navy (Navy) entered into a Consent Order to perform an RFI at the AFWTF on Vieques Island, Puerto Rico. The purpose of the RFI is to determine the nature and extent of potential releases of hazardous wastes, solid wastes, and/or hazardous constituents at or from the facility. The Consent Order was issued based on information gathered during a RCRA Facility Assessment (RFA) completed by A.T. Kearney, Inc., on October 13, 1988, and an updated RFA completed by the Puerto Rico Environmental Quality Board (PREQB) on September 27, 1995.

EPA's jurisdiction to issue the Consent Order derives from authority vested in EPA by Section 7003 of the RCRA, as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, which also mandate compliance by generators of solid and/or hazardous waste.

1.2 Facility Background

Vieques Island has a land area of approximately 33,000 acres, and is located in the Caribbean Sea approximately 7 miles southeast of the eastern coast of the island of Puerto Rico (Figure 1-1). The Navy's facility is located on the eastern one-third of the island. For the purposes of the EPA Consent Order and this Work Plan, the Facility includes both the AFWTF (comprised of 3,600 acres) and the adjacent and wholly contiguous Eastern Maneuver Area (EMA), comprised of 11,000 acres. Both are under the command of U.S. Naval Station Roosevelt Roads (NSRR). A third Navy activity, Naval Ammunition Support Detachment (NASD), is located on Vieques Island, but under RCRA is not part of the Facility because it is not contiguous and therefore is not subject to the terms and conditions of the EPA Consent Order. In total, the Navy owns approximately 68 percent (22,600 acres) of the land area of Vieques Island.



AFWTF - Altantic Fleet Weapons Training Facility
EMA - Eastern Maneuver Area
Former NASD - Former Naval Ammunition Storage Detachment

Figure 1-1
SITE LOCATION MAP
Vieques Island, Puerto Rico

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1.3 Site and Environmental Setting Characteristics

This section describes the characteristics of the site and environment, including land topography and use, climate, geology, hydrogeology, and hydrology.

1.3.1 Topography

The topography of Vieques consists generally of hills and valleys throughout the entire island. The western side of the island consists of gently rolling hills with a deeper soil profile than the eastern side, which is more exposed rugged terrain. The highest point on the western side is approximately 1,000 feet above mean sea level (msl) at Monte Pirate. The highest point on the eastern side is approximately 420 feet above msl at Cerro Matias. The coastal areas contain level terrain primarily made up of lagoons and mangrove swamps. The open burn (OB) and open detonation (OD) locations are relatively level areas containing irregular drainage patterns as a result of continuous bombing exercises (PREQB, 1995). The site topography of the AFWTF and EMA areas, focal points for this Phase I RFI investigation, is shown in Figure 1-2.

1.3.2 Land Use

In general, the AFWTF (3,600 acres) and EMA (11,000 acres) land areas remain undeveloped. The Navy land use comprises only a fraction of these two respective land areas.

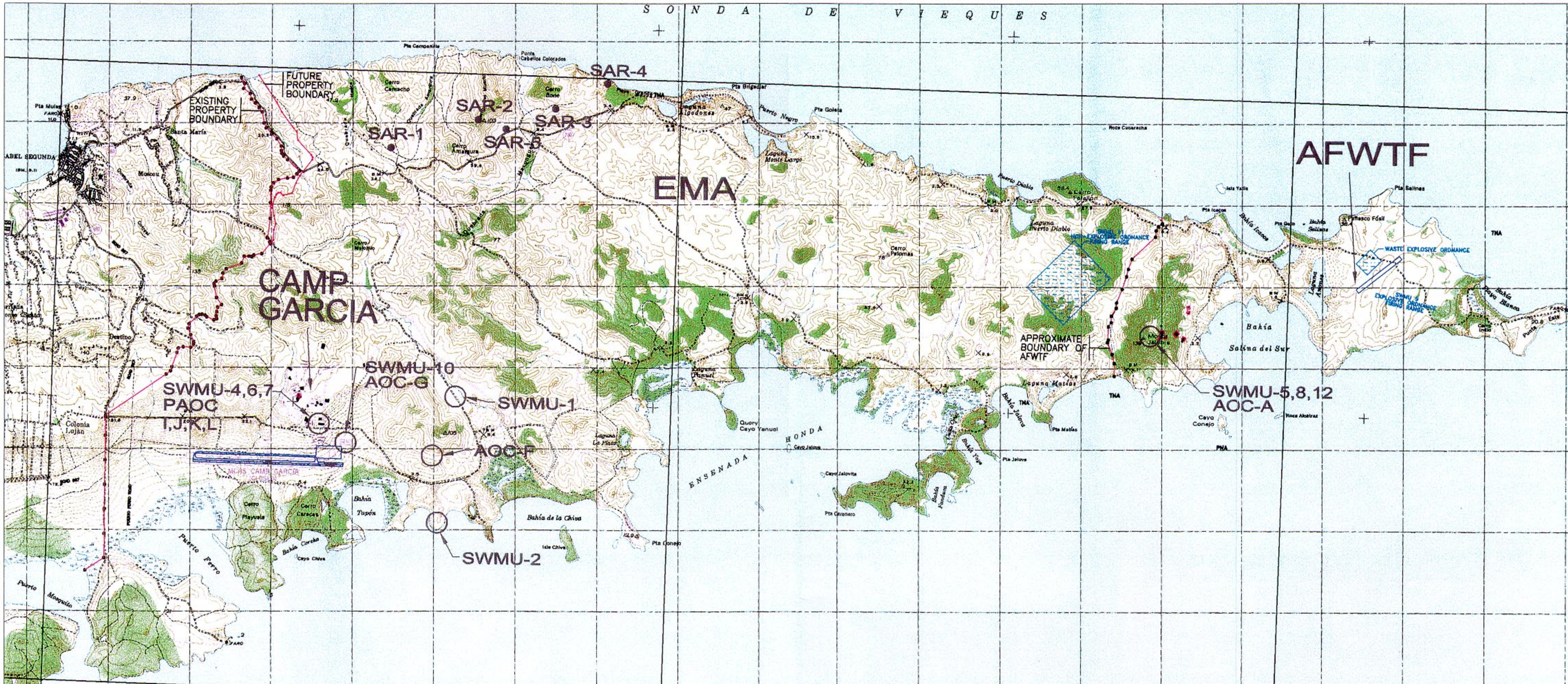
The AFWTF provides facilities and schedules naval gunfire support (NGFS) and air-to-ground (ATG) ordnance delivery training for Atlantic Fleet ships, North Atlantic Treaty Organization (NATO) ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic, conducts training for Marine amphibious units, battalion landing teams and combat engineering units in the EMA. Occasionally, naval units of allied nations with a presence in the Caribbean and the Puerto Rican National Guard also utilize the EMA.

The training areas have been in continuous use since World War II when the Navy acquired title to the land. Within the Inner Range, the Atlantic Fleet's ships, aircraft and marine forces carry out training in all aspects of NGFS, ATG ordnance delivery, air-to-surface mine delivery, amphibious landings, small arms, artillery and tank fire, and combat engineering. As part of its normal operations, unexploded ordnance are periodically cleared from the AFWTF's Inner Range and destroyed by open burning/open detonation (OB/OD) at the Facility. In addition, unserviceable military munitions are periodically received from NASD and/or NSRR for OB/OD at AFWTF.

1.3.3 Climate

The climate of Vieques is characterized as warm and humid (tropical-marine), with frequent showers occurring throughout the year. A major factor affecting the temperature on Vieques is the easterly trade winds blowing across the island year-round. This wind

moderates the temperature throughout the year, causing an annual mean temperature of 79°F to 80°F and range of 15°F to 25°F. The average rainfall is approximately 36 inches, with extremes of 25 inches in the east and 45 to 50 inches in the west (PREQB, 1995).



Legend:
EMA – Eastern Maneuver Area.
AFWTF – Atlantic Fleet Weapons Training Facility.
SWMU – SOLID WASTE MANAGEMENT UNIT
AOC – AREA OF CONCERN
PAOC – POTENTIAL AREA OF CONCERN
SAR – SMALL ARMS RANGE

NOTE:
SITES I,J,K, AND L ARE POTENTIAL AREAS OF CONCERN. THESE SITES WILL REQUIRE FURTHER INVESTIGATION TO DETERMINE WHETHER RELEASE OF HAZARDOUS MATERIAL. HAS OCCURRED AT EACH RESPECTIVE SITE.

SWMU'S 3,9, AND 11 ARE ILLUSTRATED TO PROVIDE THE LOCATION RELATIVE TO OTHER SWMUS. THESE SITES ARE LOCATED WITHIN THE LIVE IMPACT AREA AND WILL NOT BE INVESTIGATED DURING THE PHASE IRF I.

Figure 1-2
SITE LOCATION MAP
Atlantic Fleet Weapons Training Facility, Vieques Island

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1.3.4 Geology

The underlying geology of Vieques is divided into rock and sediment deposits. The upland areas contain three rock types: Upper Cretaceous volcanic rocks, Upper Cretaceous or Lower Tertiary intrusive rocks, and Upper Tertiary and Quaternary sedimentary rocks. The lowland areas are unconsolidated sediments of Quaternary age, consisting of alluvial deposits, beach and dune deposits, and swamp and marsh deposits.

The Upper Cretaceous rocks in the upland areas appear to be the oldest exposed rocks on Vieques. These rocks are believed to have been deposited in a marine environment, as was the case with rocks of the same age on the island of Puerto Rico.

Limestone of the upper Tertiary age is found in peninsulas extending into the sea from the southern and eastern coasts of Vieques. Limestone of the Tertiary-Miocene age is also found along these coasts, and is commonly referred to as Puerto Ferro limestone. Quaternary age deposits are typically found in the valleys and coastal areas. These deposits include beach, swamp, and alluvial deposits. The deposits of sand, swamp, and salt mud occur in the coastal areas.

Although sand and crushed quarried stone are typically geologic resources, the limestone on Vieques is too soft and not of the right purity for use as crushed stone or in cement. Quartz diorite, however, has served as a source of crushed rock for military construction. The sand on the island can be divided into two major types: alluvial and marine-deposited calcareous sand. The alluvial sand is used in construction materials such as mortars (PREQB, 1995).

1.3.5 Soils

Soils on Vieques Island are primarily residual, because of both climatic and subsurface rock conditions. The eastern side of the island has poorly developed soil due to the impermeable volcanic rock and the nature of the climate.

Soils on Vieques are typically classified into one of five groups. The first group is referred to as the Descalabrado series. This group accounts for 30 percent of the total land surface area on the island. This soil is shallow and well-drained, and typically very dark brown to dark grayish-brown. Grasses and shrubs are the only types of vegetation able to grow in this particular type of soil. Grazing, wildlife, and woodland are the only other uses for this soil. The second group is the Vieques series, which accounts for approximately 26 percent of the total land surface area on the island. This series is typically shallow, and is found in the upland regions of the island. The soil is dark brown in color, and has good drainage with moderate permeability. The third group is the Coamo series. This soil makes up approximately 16 percent of the total land surface area on the island. This soil is typically deep and well-drained in nature. The surface layer is very dark and slightly acidic to neutral. Agriculture can be maintained here along with xeric trees and brush. The fourth group is the Rock Land area. This area accounts for approximately 8 percent of the total land area on the island. This area is labeled Rock Land because either rock

outcrops occur, or loose stones and boulders are common. Volcanic rock and limestone are the principal constituents of this area, and brush and shrubs are the only vegetation visible. The fifth group is divided into eleven additional categories which account for the remaining 20 percent of the land surface area: Ametia, Cartagena, Catano, Coastal Beaches, Descalabrado, Fraternidad, Jacana, Pandura, Paso Seco, Pancena and Pozo Blanco.

Although ATG ordnance delivery and NGFS exercises are conducted on Vieques, soil conditions have not been severely altered on the island, because of the vegetation, soil, and surface drainage characteristics.

1.3.6 Surface Water

The streambeds found on Vieques Island flow either to the north or to the south until they reach the sea. Vieques does not have any perennial surface drainage, and has an average of 36 inches of annual rainfall. Of the 36 inches of annual rainfall, approximately 90 percent is lost to evaporation, based on statistics from the U.S. Virgin Islands. Of the remaining 10 percent, approximately 5 percent infiltrates into the ground recharging the groundwater aquifer, and 5 percent becomes surface runoff.

1.3.7 Groundwater

The groundwater on the island occurs in two aquifers: the Valle de Resolucion located beneath the western portion of the island, and the Valle de Esperanza located beneath the southern portion of the island near Camp Garcia. As discussed previously, approximately 5 percent of the annual precipitation infiltrates through the ground and supplies the aquifers. The Valle de Esperanza is the more productive of the two aquifers, and has been used as a source of drinking water. The Valle de Esperanza aquifer previously supplied water to Camp Garcia and Observation Post-1 (OP-1). The Puerto Rico Aqueduct and Sewer Authority (PRASA) was in charge of a series of 16 wells that pumped approximately 450,000 gallons of water per day. These wells are no longer active, however, because of the installation of a water line from the island of Puerto Rico to Vieques Island in 1978. Camp Garcia and OP-1 are now supplied by surface water from the main island of Puerto Rico.

The U.S. Geological Survey (USGS) has performed a groundwater study on Vieques, including tests on the wells near Esperanza. The results indicate that the groundwater contains high concentrations of sodium bicarbonate. Because of its high sodium content, the groundwater on Vieques is not suitable for extended irrigation use. The high levels of sodium result from sea spray infiltrating into the ground, and saltwater entering the groundwater supply as a result of excessive groundwater withdrawal (USGS, 1989).

1.4 Identification of Potential Receptors

Under normal circumstances, groundwater and surface waters are not utilized for municipal drinking water supply on Vieques Island. Based on information from the Puerto Rico Department of Health (DOH), the existing water supply wells on Vieques are used for emergency municipal water supply when drinking water supplies are not available via the normal source. Since the late 1970s, this source has been an undersea pipeline from the island of Puerto Rico. The most recent usage of public back-up wells on Vieques for obtaining municipal water supplies occurred in 1998 after Hurricane Georges. In addition, private non-permitted wells may exist; groundwater from such wells may be utilized for human consumption, but no cases of this are currently documented. Therefore, a potential exposure pathway, resulting in unacceptable human health threats, may be present as a result of human consumption of Vieques Island groundwater impacted by releases of hazardous wastes and/or constituents from AFWTF.

Although the Facility has restricted access, the Navy also allows routine access by the public for recreational swimming, picnicking, and possible recreational fishing and crabbing, at certain beaches within the facility's boundaries. Therefore, other possible exposure pathways for adverse human health impacts (in addition to possible human consumption of groundwater from non-authorized wells) include:

1. Human consumption of faunal species that bio-accumulate released hazardous constituents, which may occur as a result of either onsite recreational fishing, crabbing, etc., by public citizens visiting the Navy's facility or by onsite Navy personnel, or via offsite recreational and/or possibly commercial fishing, crabbing, etc. in the surface waters surrounding the facility

2. Accidental ingestion of, or dermal contact with, contaminated surface waters and/or contaminated soils, either by onsite workers or by public citizens visiting the Navy's Facility for onsite recreational swimming and picnicking at beaches within the facility limits

3. Possible inhalation of contaminated fugitive dust by onsite workers, recreational users visiting onsite, or offsite residents in communities adjoining the western portion of the facility

Pathways for adverse impacts to the environment include:

- Discharge of contaminated groundwater to the surface waters of the surrounding Caribbean Sea and the associated bays

- Direct transport via stormwater run-off of hazardous waste and/or constituents and/or contaminated soils, to the surface waters of the surrounding Caribbean Sea and the associated bays

- Fugitive-dust transport of hazardous waste and/or constituents and/or contaminated soils, to the surface waters of the surrounding Caribbean Sea and the associated bays

1.5 Contaminant Source Characterization (Nature and Extent of Contamination)

1.5.1 Solid Waste Management Units and Areas of Concern

Previous investigations of the areas covered by this work plan consist of an Initial Assessment Study by Greenleaf/Telesca in 1984, an RFA completed by A.T. Kearney, Inc., on October 13, 1988, and an updated RFA completed by the PREQB on September 27, 1995. The two RFAs both identified 11 Solid Waste Management Units (SWMUs) and eight Areas of Concern (AOCs); the designations of certain AOCs in the Updated RFA are different, however, than those used in the 1988 RFA. For the purposes of the EPA Consent Order and this Work Plan, 12 SWMUs and three AOCs have been defined, as presented in Tables 1-1 and 1-2.

TABLE 1-1
List of Solid Waste Management Units (SWMUs)

SWMU #	Description
1	Camp Garcia Landfill (Eastern Maneuver Area)
2***	Fuels Off-Loading Site
3**	Waste Explosive Ordnance Detonation Area
4 */***	Waste Areas of Building 303 (Camp Garcia), including:
	- Spent Battery Accumulation Area
	- Catch Basin for Hydraulic Oil (ex, "AOC C")
	- Cleaning/Degreasing Basin (ex, "AOC D")
	- Rags, absorbent and grease storage area (ex, "AOC E")
5***	Spent Battery Accumulation Area (Inner Range)
6***	Waste Oil and Paint Accumulation Area (Seabees Area at Camp Garcia). To include any releases from the adjacent "Lubricating Oil Storage Area" (formerly part of "AOC H")
7***	Waste Oil Accumulation Area (outside building 303 at Camp Garcia). To include releases from the adjacent "Lubricating Oil Storage Area" (formerly part of "AOC H").
8***	Waste Oil Accumulation Area (Inner Range)
9**	Explosive Ordnance Firing Range
10	Sewage Treatment Lagoons (Camp Garcia)
11**	Non-Explosive Ordnance Firing Range
12 */***	Solid Waste Collection Unit Area (ex, "AOC B")

* "AOC B" as listed in the 1988 RFA and the 1995 updated RFA, has been determined to be a waste management unit which constitutes a SWMU, and is identified in this Work Plan as SWMU 12. "AOC C," "AOC D", and "AOC E" as listed in the 1988 RFA and 1995 Updated RFA, have also been determined to be SWMUs, and because they are all located inside Building 303 at Camp Garcia, which also contains SWMU 4, they have been included as part of SWMU 4, which for the purposes of this Work Plan includes all four waste management areas. Also, "AOC H" as described in the 1988 RFA and 1995 Updated RFA, consists of two areas essentially contiguous with SWMUs 6 and 7 respectively; therefore, areas described as "AOC H" have been included with those two SWMUs.

** Active military range area, excluded from any corrective action requirements under the terms and conditions of the EPA Consent Order, pursuant to Section IV.7.(d).

*** Although the 1988 RFA and 1995 Updated RFA recommended no environmental sampling, EPA has subsequently determined that based on unit design and/or past operational practices, past releases of hazardous wastes and/or solid wastes and hazardous constituents are possible, and Phase 1 RFIs (Release Assessments) are warranted.

TABLE 1-2
List of Areas of Concern (AOCs)

AOC	Description
A */**	Diesel Fuel Fill Pipe Area (Observation Post 1)
F */**	Rock Quarry (Camp Garcia)
G */**	Pump Station and Chlorination Building at Sewage Lagoons (Camp Garcia)

* As discussed previously, "AOC B" as listed in the 1988 RFA and 1995 Updated RFA, has been determined to be a SWMU, and is identified in this Work Plan as SWMU 12. AOCs "C", "D", and "E", as listed in the 1988 RFA and 1995 Updated RFA, have also been determined to be SWMUs, and because they are all located inside Building 303 at Camp Garcia, along with SWMU 4, they have been included in this Work Plan as part of SWMU 4. Also, "AOC H" as described in the 1988 RFA and 1995 Updated RFA, consists of two areas essentially contiguous with SWMUs 6 and 7 respectively; therefore, any releases from areas described as "AOC H" have been included with those two SWMUs. To be consistent with the AOC terminology utilized in the 1988 RFA and 1995 Updated RFA, the designation of other AOCs has remained as in those two documents.

** Although the 1988 RFA and 1995 Updated RFA recommended no environmental sampling, EPA has subsequently determined that based on unit design and/or past operational practices, past releases of hazardous wastes and/or solid wastes and hazardous constituents are possible, and that Phase 1 RFIs (Release Assessments) are warranted.

Three of the SWMUs listed in Table 1-1 (SWMU 3 - Waste Explosive Ordnance Detonation Area, SWMU 9 - Explosive Ordnance Firing Range, and SWMU 11 - Non-Explosive Ordnance Firing Range) are within active military ranges, and are expressly excluded from any corrective action requirements under the terms and conditions of the EPA Consent Order (EPA, 2000). EPA has stated in its Consent Order, however, that "releases of hazardous waste(s) and hazardous constituents from those three SWMUs are considered highly probable, based on the design and operating practices at those SWMUs, and any releases at those three SWMUs are subject to RCRA corrective action authority pursuant to 40 CFR § 264.101, and/or closure requirements of 40 CFR Part 264. Accordingly, EPA reserves its rights to require corrective action at those three SWMUs, which shall be investigated and remediated as necessary under the requirements of a RCRA Subpart X open burning/open detonation permit, when issued, which the facility has applied for. That permit application is currently under review by EPA."

1.5.2 Documentation of Release

Based on visible evidence such as the presence of staining, releases of hazardous or solid wastes and/or hazardous constituents to the environment may have occurred at certain non-range SWMUs and AOCs that are addressed in this Work Plan and which are subject to the EPA Consent Order. At SWMU 2 (Fuels Off-Loading Site), the 1988 RFA and 1995 updated RFA both infer that approximately 100,000 gallons of fuel were likely to have been released to the land and sea over the 25-year period during which this site

was utilized. At SWMU 6 (Waste Oil and Paint Accumulation Area), the 1988 RFA and 1995 updated RFA both reported that spills of oil to the soil were observed at this SWMU, indicating potential releases. At SWMU 7 (Waste Oil Accumulation Area), the 1988 RFA and 1995 updated RFA reported that the soils at that SWMU were severely stained, and described past practices which included digging up visibly stained soil at the SWMU, further indicating that releases occurred. Similarly, staining is reported in the 1988 RFA and 1995 updated RFA for the "Lubricating Oil Storage Area," which is classified as part of SWMU 7 for the purposes of this Work Plan. Likewise, at AOC "A" (Diesel Fuel Fill Pipe), the 1988 RFA and 1995 updated RFA described soils surrounding the fuel fill pipe as being severely stained, indicating a potential release.

Because only limited environmental sampling has been conducted at the SWMUs and AOCs addressed by this Work Plan, no definitive releases have been confirmed at those SWMUs or AOCs. Soil sampling has been conducted at some of the active military range areas (SWMUs 3 and 9) of the facility, which are excluded from the corrective action requirements of the EPA Consent Order under Section IV.7.D. Soil samples were collected in 1991 by the Navy in areas of SWMU 3 (Waste Explosive Ordnance Detonation Area) and SWMU 9 (Explosive Ordnance Firing Range), and analyzed for the Toxicity Characteristics (TC) of 40 CFR § 261.24 utilizing the Toxicity Characteristics Leaching Procedure (TCLP). Results of that sampling were included in the June 28, 1993, RCRA Part B Hazardous Waste Permit Application submitted for the facility by the Navy.

Surface soil sampling was conducted in June 2000 at SWMU 4, SWMU 6, SWMU 7, SWMU 10, and AOC F because of increased activities around these sites related to the Navy's transfer of vehicle maintenance activities from NASD to Camp Garcia, located in the EMA. Additionally, subsurface soil samples and wastewater samples were collected at SWMU 10. Preliminary results of unvalidated data were presented in the August 1, 2000, Quarterly Report for AFWTF. No releases were confirmed at these sites. Several metals were detected, however, in surface soil samples. These metal detections will be addressed by a background study. A separate work plan will be prepared to address background concentrations of metals in soil and groundwater at the AFWTF and EMA. Sampling results for these five sites will be presented in the Phase I RFI report.

SECTION 2

Technical Approach

The information in Section 1 on the project and facility background provides the basis for developing the technical approach to the Phase I RFI that is summarized in this section. In particular, Section 2 details the objectives and technical approach for the field activities of the Phase I RFI. This section also includes brief descriptions of the other tasks that will be performed to meet the objectives of the project. Table 2-1 summarizes all RFI field activities, their objectives, and the technical approaches employed to conduct the activities.

Following execution of the onsite Phase I RFI investigation, a report will be prepared that will make recommendations of either No Further Action (NFA) or a full RFI for each site investigated. At this time, it is assumed that a full RFI will be recommended for selected sites. Following execution of a full RFI, a report will be prepared detailing the findings of the RFI. The RFI report will recommend either a Corrective Measures Study (CMS) or NFA.

2.1 Task FI—Field Investigation

The field investigation includes a number of tasks: surface geophysical surveys, surface soil sampling, soil borings, monitoring well installation, water level measurements, groundwater sampling, chemical analyses in fixed laboratories, well testing, and soil sampling. This section describes the rationale for collecting the data in each step of the investigation and for assuring that the data accurately and precisely represent conditions at the facility.

For each site included in this Phase I RFI, the number and approximate locations of sampling points are defined based on available information. The number and locations of these samples are subject to change and will be finalized in the Site-Specific Work Plan.

Details of the actual field methodologies to be used in the investigations are provided in the Sampling and Analysis Plan (SAP).

2.1.1 Historical Aerial Photograph Analysis

Prior to conducting additional site investigations at the identified SWMUs, a historical aerial photograph analysis will be completed for the EMA and AFWTF. The assessment will be conducted to assess whether any other potential sources of soil and groundwater contamination might exist that were not identified in the RCRA RFA or the Consent Order. The analysis will include the following components:

- A review of historical environmental information, including permits, spill reports, previous investigations, and analytical data
- Interview with site personnel to identify potential areas of concern
- Historical aerial photograph analysis to identify areas of disturbed vegetation, cleared areas, and waste disposal areas

TABLE 2-1
Summary of Objectives and Technical Approaches of Phase I RFI Activities

RFI Activity	Objective(s) of Activity	SWMU/AOC/ PAOC/PI #	Technical Approach to Fulfill Objectives
a) Surface Soil Sampling	Evaluate surface soil quality around potential source areas to determine if a release of hazardous materials has occurred.	01, 02, 05, 08, 10, 12, AOC G	Clean surface area (1 to 2 inches) to remove grass and other vegetation as required. Collect sample using stainless steel trowel, spoon, or hand auger.
b) Soil Borings and Well Installation	Identify and evaluate the stratigraphy beneath and adjacent to each particular site, especially as it relates to influencing the movement of groundwater through the shall water bearing units potentially impacted by hazardous releases; provide permanent points for measuring hydraulic properties and groundwater quality at and adjacent to the facility	01, 02, 04, 10	Use rotary drilling to collect samples of the stratigraphy beneath each site. Characterize lithology and select samples for both chemical and physical analyses. Install wells at strategic locations to be used to sample groundwater, measure water levels, and estimate hydraulic characteristics. Several soil borings and wells will be installed off the site to characterize background conditions.
c) Monitoring Well Groundwater Sampling and Analysis	Evaluate the facility-wide groundwater quality, especially as it relates to potential risks to human health and the environment	01, 10	Analyze groundwater samples for a broad range of chemical constituents, including those related to potential human health and environmental risk and those related to characterizing the origin of the groundwater an the fate and transport of its constituents.
d) Water Level Measurements	Determine horizontal and vertical hydraulic gradients in water-bearing units so that directions(s) and rates of groundwater movement can be evaluated	01, 10	Collect synoptic and continuous water level measurements from monitoring wells.
e) Well Testing	Estimate the hydraulic properties of the significant water-bearing units to determine potential contaminant migration	01, 10	Conduct slug testing on the shallow water-bearing units.
f) Surface Geophysical Surveys	Map the aerial extent of disposal cells and trenches in the land fill area. Map the location of buried utilities.	01	Collect magnetic and/or electromagnetic data along transect lines using a digital data logger and Global Positioning System. Analyze data by contouring and profiling to detect anomalous areas. Use results to locate groundwater and soil sampling points.
g) Visual Site Inspections	Evaluate photo-identified sites to determine potential release locations	PIs 1-23, 11 PAOCs	Perform visual site inspections to evaluate current conditions and locations of potential past releases to the environment.

2.1.2 Initial Site Visit

Before beginning the sampling investigation, CH2M HILL will visit each proposed site included in the Phase I RFI. Numbers of samples to be taken and sample locations that were estimated based only on literature or aerial photograph review will be verified or altered in the field based on site layout and conditions. Only after the initial site visit will mobilization for monitoring well installation and soil sample collection begin.

2.1.3 SWMU 1—Camp Garcia Landfill

According to the RFA, the Camp Garcia Landfill is located in the EMA approximately 4,000 feet north-northwest of Blue Beach. The actual landfill is located approximately 3,000 feet east of Camp Garcia (PREQB, 1995).

According to the Navy Assessment and Control of Installation Pollutants (NACIP) Initial Assessment Study (IAS) report (Greenleaf/Telesca, 1984), this SWMU was in operation from approximately 1954 to 1978, when it became inactive. When this SWMU was operational, this landfill handled paper, corrugated containers, cans and food packaging material, rags, scrap metal, and yard waste. The municipal waste from both Camp Garcia and the Inner Range was handled here. This particular landfill was not lined; it serviced approximately 150 individuals, depending on military exercises. One 5-ton dump truck was used every day, 5 days per week, to dispose waste to this site. According to PREQB (1995), approximately 1,800 to 3,120 tons of waste were distributed over the 100 to 200-acre area. An aerial photo analysis of the landfill, however, indicated that the fill area extended over an area of approximately 50 to 55 acres (Lockheed Martin, 1999, and ERI, 2000). When this SWMU became inactive, a cap was installed. The landfill today is vegetated with dense grasses, and a gravel road constructed in the mid-1980s runs down its center. During the visual site inspection (VSI), no signs of erosion or stresses on vegetation were observed. No documentation was discovered regarding releases at this SWMU (PREQB, 1995). During a February 2000 CH2M HILL site visit, no signs of previous landfill activities were visible at SWMU 1.

Based on the review of the limited information available for the site, the Phase I RCRA Facility Investigation (RFI) is assumed to include the following:

- A detailed aerial photograph analysis
- A geophysical survey using magnetometer and/or EM methods
- Installation of five groundwater monitoring wells
- Collection of five groundwater samples
- Collection of approximately 50 surface soil samples
- Analysis of these samples for Appendix IX constituents and explosives

Institutional controls that preclude intrusive activities at the landfill will be installed and will negate the need for subsurface soil samples at the site.

One monitoring well will be located upgradient of disposal areas and four wells will be located downgradient of disposal cells and trenches. Exact locations will be shown in the Site-Specific Work Plan. These estimations will be verified or altered upon the initial site visit.

2.1.4 SWMU 2—Fuels Off-Loading Site

SWMU 2 is located at Camp Garcia, and is the former location of four aboveground fuel storage tanks (ASTs). The tanks consisted of two 20,000-gallon tanks and two 30,000-gallon tanks. These tanks became operational in 1953 and were removed between 1978 and 1979. The refueling process took place every 3 months, and consisted of a barge pumping fuel through an 8-inch submarine line to each tank. Before beginning this refueling process, seawater had to be flushed from the submarine line. During this process, approximately 1,000 gallons of fuel were discharged into the ocean and onto the land. According to the NACIP IAS study, this refueling process took place for approximately 25 years; therefore, approximately 100,000 gallons of fuel may potentially have been discharged during this period of time.

The following fuels were stored at this site during the operational period: diesel fuel, leaded gasoline, AVGAS, and JP-5 fuel. The sludge that developed in these tanks was removed by a private contractor and was disposed of on the main island of Puerto Rico.

The site today is overgrown with grass and small shrubs, with only minimal signs of previous activity. During the VSI, no signs of previous releases to either the soil or the water were apparent, and no release controls were identified (PREQB, 1995). These same conditions were observed during the CH2M HILL February 2000 site visit.

Based on the review of the limited information available for the site, the Phase I RFI is assumed to include collection of 12 surface soil samples and analysis of samples for Appendix IX constituents and explosives. Two soil borings, one in the area of the former fuel tanks and one in the area of the former discharge pipeline downgradient from the southern most tank, will be installed to depths of 15 feet below land surface (bls). Exact locations will be illustrated in the Site-Specific Work Plan. These estimations will be verified or altered upon the initial site visit. Detailed locations of sampling sites are presented in the Site-Specific Work Plan.

2.1.5 SWMU 4—Waste Areas of Building 303 (Camp Garcia)

According to the RFA, the waste areas located in Building 303 at Camp Garcia include a spent battery accumulation area; a catch basin for hydraulic oil; a cleaning / decreasing basin; and a rags, absorbent, and grease storage area. The last three areas listed were once individual AOCs, but were changed to waste management units in the Administrative Order On Consent (EPA, 2000).

The battery accumulation area contains spent batteries and battery acid to be disposed of offsite on NSRR. Once at NSRR, the batteries and acid will then be removed by a contractor. According to the RFA, this area in Building 303 was established as a storage area for batteries when the building was erected in the 1960s. This unit is still considered active, and continues to house spent batteries and battery acid. During the VSI, no batteries or acid were present at this location. This area contained no visible signs of leakage on the concrete floor from previous storage of these materials. The catch basin for hydraulic oil, approximately 5 feet long and 6 inches wide, is an area inside Building 303 designed to catch any hydraulic oil which may drip from the tanks. During the VSI, no signs of leakage were visible on the cement floor under the basin.

The rags, adsorbent, and grease storage area is also found in Building 303, and contains barrels of grease, rags, and other materials used when a spill develops. According to the RFA, this was also the area where spent batteries were once stored. During the VSI, no signs of spills were visible. These same conditions were observed during the CH2M HILL February 2000 site visit.

No information was available in the RFA to describe the cleaning / degreasing basin (PREQB, 1995).

Initial surface sampling was conducted in June 2000. The initial sampling included the collection of 12 surface soil samples and analysis of samples for Appendix IX constituents and explosives. Results will be presented in the Phase I RFI report along with the analytical results of the proposed background study. The Phase I RFI will include the installation of one soil boring outside the catch basin for hydraulic oil. One soil sample will be analyzed for Appendix IX constituents and explosives. If the degreasing basin can be located, one soil boring will be installed in the basin and four soil samples will be analyzed for Appendix IX constituents and explosives. If a dry well is located at SWMU 04, one soil boring will be installed in the dry well and four soil samples will be analyzed for Appendix IX constituents and explosives.

2.1.6 SWMU 5—Spent Battery Accumulation Area (Inner Range)

This SWMU is located in the Inner Range portion of this installation and is similar to SWMU 4. The batteries and battery acid stored here, however, are outside on a gravel driveway. According to the RFA, the acid from these batteries typically is emptied into plastic containers and shipped to NSRR.

Although the start-up date for this SWMU is unknown, it remains active. During the VSI, a total of nine batteries were stored on the gravel driveway at this site. No signs of any spills or leaks from these batteries were visible. No release controls were identified at this SWMU (PREQB, 1995). During the CH2M HILL February 2000 site visit, release controls (plastic storage trays) for battery storage were present, but no batteries were stored at the site. No signs of releases of battery acid were observed.

Based on the review of the limited information available for the site, the Phase I RFI is assumed to include the collection of four surface soil samples and analysis of these samples for Appendix IX constituents and explosives. These estimations will be verified or altered upon the initial site visit. Sample locations are shown in the Site-Specific Work Plan.

2.1.7 SWMU 6—Waste Oil and Paint Accumulation Area (Seabees Area at Camp Garcia)

According to the RFA, this area is used by the Seabees as a storage area for waste oil and paint.

The waste oil at this location is containerized in 55-gallon drums, and the paint is housed in small containers. Tires and two drums of lubricating oil are also present at this site. The waste oil and tires are stored on a grassy area until they are shipped offsite to NSRR. The RFA states that this area became active approximately 10 years ago, and remains active. During the VSI, signs of oil leakage from the drums into the ground were visible. No release controls are present at this site (PREQB, 1995). During the CH2M HILL February 2000 site visit, no drums or waste materials were present at the site. During an interview with site personnel in June 2000, it was determined that SWMU 6 was located adjacent to SWMU 7 and that the two SWMUs can be investigated at the same time. Initial Phase I RFI sampling was conducted in June 2000. Ten surface soil samples were collected and analyzed for Appendix IX constituents and explosives. Results will be presented in the Phase I RFI report along with the analytical results of the proposed background study.

2.1.8 SWMU 7—Waste Oil Accumulation Area (outside Building 303 at Camp Garcia)

According to the RFA, this area is located outside Building 303 at Camp Garcia. This area is used by the Marines for 3 months per year. During these 3 months, Marines practice their exercises at the EMA, and need a place to dispose of waste oil from the maintenance of their vehicles. This area includes an open-top 55-gallon drum, 25-gallon trash can, and two drums cut in half. According to the RFA, the soil in this area is typically stained with waste oil after maintenance procedures on Marine vehicles. Once the Marines complete their training, they reportedly excavate the soil under the waste oil storage area and mix it with sand. The excavated soil is reportedly then containerized in 55-gallon drums and shipped to NSRR. Although the start date for this site is unknown, the Marines continue to use this area for training. During the VSI, the drums appeared to be full, and signs of waste oil were visible in the soil at this site. No release controls were identified at this SWMU (PREQB, 1995). During the CH2M HILL February 2000 site inspection, no drums of waste oil or other material were present in the area.

This site was investigated along with SWMU 6 in June 2000. The sites are adjacent and were investigated as one large unit (for both SWMU 6 and SWMU 7). Ten soil samples were collected and analyzed for Appendix IX constituents and explosives. Results will be

presented in the Phase I RFI report along with the analytical results of the proposed background study.

2.1.9 SWMU 8—Waste Oil Accumulation Area (Inner Range)

This accumulation area is located outside the generator building at the observation post on Cerro Matias.

According to the RFA, this area contains drums that store both waste lubricants and oils. These drums are stored on bare soil prior to being shipped offsite to NSRR. This accumulation area started approximately 10 years ago, and remain active. During the VSI, minimal spills of lubricating oil were present in the area of the drums. No release controls were visible at this site (PREQB, 1995). During the CH2M HILL February 2000 site inspection, no soil straining was evident in the accumulation area, and the drums were stored in plastic secondary containment trays for release control.

Based on the review of the limited information available for the site, the Phase I RFI is assumed to include the collection of five surface soil samples and analysis of samples for Appendix IX constituents and explosives. Sample locations are shown in the Site-Specific Work Plan.

2.1.10 SWMU 10—Sewage Treatment Lagoons

According to the RFA, the sewage treatment lagoons for Camp Garcia went into service when the adjacent pump station was installed in the early 1950s. This SWMU is still considered active.

These lagoons are divided into two stages for the treatment of domestic waste. Four unlined lagoons are utilized in this process; two received the waste, and two were considered polishing lagoons. Following waste treatment in the polishing lagoons, the remaining liquid was land applied. Because only a small number of Navy Seabees and civilians (45 people) use the sanitary facilities daily, the amount of domestic waste generated was small. Although unlikely, the presence or absence of hazardous constituents in the waste has not been determined. No signs of release are visible at this SWMU, although sampling has not been conducted here (PREQB, 1995). Inspection of the sewage lagoon system during the CH2M HILL February 2000 site visit revealed that the lagoon system was overgrown with vegetation and did not appear to be active.

An initial investigation including the collection of four surface and subsurface samples and one wastewater sample was conducted in June 2000. Results will be presented in the Phase I RFI report. Additional investigations will include the installation of four monitoring wells, collection of 16 surface soil samples, collection of 16 subsurface samples, and analysis of samples for Appendix IX constituents and explosives. Sample locations are shown in the Site-Specific Work Plan.

2.1.11 SWMU 12—Solid Waste Collection Unit Area

This area was formerly referred to as AOC B, but in accordance with the Administrative Order of Consent (EPA, 2000), it was decided that this area should be a waste management unit identified as SWMU 12.

The collection area contains storage devices used to containerize garbage prior to its disposal at the Vieques Island landfill. The containers used to store this garbage include wooden boxes, wooden trailers, and metal dumpsters and cans. During the VSI, only a wooden trailer was visible at this site (PREQB, 1995).

Based on the review of the limited information available for the site, the Phase I RFI is assumed to include the collection of five surface soil samples, and analysis of samples for Appendix IX constituents and explosives. Sample locations are shown in the Site-Specific Work Plan.

2.1.12 AOC A—Diesel Fuel Fill Pipe Area (Observation Post I)

According to the RFA, this area contains a pipe used to fill the underground storage tank (UST) located at OP-I in the Cerro Matias.

The UST and the fill pipe were first put into service approximately 10 years ago. This site contains a 6-foot by 6-foot area of soil in the area of the fill pipe which was found to be stained with fuel from spills during previous refueling procedures. Because the tank is located 25 feet southwest and downgradient of the fill pipe, this staining does not appear to come from the tank. No release controls were found at this site (PREQB, 1995).

The UST, associated piping including the fill pipe, and surrounding soil were excavated and removed for disposal in 1997. The UST was replaced with a new UST. Four confirmation soil samples (sample numbers 23 through 26) were collected from the excavation and analyzed for petroleum-related constituents. No petroleum-related constituents were detected in any of the four soil samples as documented in Table 3-1, Appendix A, of the Site-Specific Work Plan.

Because the soil surrounding the UST and associated piping, including the fill pipe, was excavated and removed for disposal during the 1997 tank replacement, and because the confirmation soil sampling conducted during the tank replacement did not indicate the presence of petroleum-related constituents, no further action is proposed for this site.

2.1.13 AOC F—Rock Quarry (Camp Garcia)

According to the RFA, this site is located southwest of the former Camp Garcia landfill.

This site contains the gravel that the Navy uses for roads and other construction purposes. During the VSI, however, more than just rocks were present in this quarry. Used tires and some paper waste were also visible at this location (PREQB, 1995). During the CH2M HILL February 2000 site inspection, no waste tires or other waste materials were observed at the quarry, and the quarry did not appear to be active.

The preliminary Phase I RFI in June 2000 included the collection of five surface soil samples and the analysis of samples for Appendix IX constituents and explosives. Results will be included in the Phase I RFI report along with the analytical results from the proposed background study.

2.1.14 AOC G—Pump Station and Chlorination Building at Sewage Lagoons (Camp Garcia)

This site, which is located at Camp Garcia, became active in the 1950s. After approximately 30 years of service, this building was shut down because of decreased activity at the facility.

The main purpose of this building was to pump and chlorinate domestic waste water. This building was constructed using concrete, and built partially below grade. During the VSI, stains were visible on the concrete unit because of previous overflowing of the unit. No signs of damage to the grassy area in the general vicinity were apparent (PREQB, 1995). During the CH2M HILL February 2000 site inspection, no staining was observed in the chlorination building, and the site was overgrown with vegetation.

Based on the review of the limited information available for the site, the Phase I RFI is assumed to include the collection of five surface soil samples and analysis of samples for Appendix IX constituents and explosives. Sample locations are shown in the Site-Specific Work Plan.

2.1.15 Future Steps in the RCRA Process

The Phase I RFI is limited in scope and is intended to gather sufficient data to confirm the presence of absence of contamination at a SWMU or AOC, and to provide the information necessary to develop the scope of work for a full RFI or to support an NFA decision.
Sites that are determined to be contaminated as a result of this Phase I RFI will be involved in one or various combinations of the following specific activities.

2.1.15.1 Full RCRA Facility Investigation

The full RFI is appropriate when the preceding Phase I RFI has characterized or identified a release of contaminants. This additional study of the facility is typically required either under a schedule of compliance designated in the Site Management Plan (SMP) or under an enforcement order. For AFWTF, the enforcement order will be the compliance schedule.

The purpose of the full RFI is to characterize the nature and extent of the contamination at the facility and to gather sufficient data to support a risk assessment, CMS, NFA decision, or an Interim Measure (IM). The objective of the investigation is to characterize the SWMU or AOC, define potential release locations, define the degree and extent of contamination, and identify actual and potential receptors.

If the full RFI reveals a release that poses a threat of immediate harm to human health and the environment, an IM may be required. If there is no immediate threat to human health or the environment, the existence of contamination above acceptable levels will require an CMS to evaluate potential corrective action alternatives. If the contaminants detected do not exceed the screening criteria, or if the risk assessment indicates that no unacceptable risks to human health or the environment exist, the RFI will recommend NFA for the facility.

2.1.15.2 Corrective Measures Study

A CMS may be required when the Full RFI findings show that conditions at the SWMU or AOC pose unacceptable current or future risks to human health or ecological receptors. The CMS process involves several technical actions to develop feasible corrective measures to remediate the site. The primary objective of the CMS process is to identify, evaluate and recommend remedial technologies that are applicable to the site conditions and the nature and extent of the release.

2.1.15.3 Interim Measure

At any time during the CERCLA process, an IM may be conducted if it is determined that an imminent threat exists to human health or the environment. An IM is intended to prevent or minimize the further spread of contamination while long-term remedies are pursued. Additionally, an IM may be performed in order to obtain approval of an NFA recommendation. IMs will be conducted, if applicable, during the investigation process.

2.1.16 Subcontractor Procurement

A number of subcontractors will be procured for the Phase I RFI. All subcontractors will be procured through a precise bid or proposal procedure. Below is a list of potential subcontractors and their anticipated use.

- Surveyor—survey existing and newly installed wells
- Utility search—survey intrusive sampling locations where clearance of buried utilities cannot be confirmed
- Rotary drilling service—soil boring and well installation
- Analytical laboratory—analyze soil, sediment, and groundwater samples for chemical constituents
- Geophysical surveys—map locations of landfill trenches
- Data validation—validate all samples collected for chemical analysis
- Investigation-Derived Waste (IDW) disposal service—hauling and disposal of all soil and groundwater IDW

2.1.17 Investigation-Derived Waste Management and Demobilization

Demobilization activities include general site restoration and handling and disposal of IDW. IDW handling and disposal procedures are discussed in the IDW Management Plan (IDWMP).

2.2 Task DM—Data Management

Analytical results to be used for human health or ecological risk assessment will need the highest level of data quality, and samples will be analyzed in a Navy-approved and contract laboratory program (CLP)-certified fixed laboratory with full documentation using EPA-approved methods. Analyses will include the proper ratio of field QC samples (e.g., one duplicate sample per 10 regular samples) recommended by Naval Facilities Engineering Command (NAVFACENGCOM) guidance (*Navy Installation Restoration Laboratory Quality Assurance Guide*, Naval Facilities Engineering Services Center [NFESC], February 1996).

For certain chemicals, EPA Region IX has calculated screening level criteria for potential risk to human health and the environment. To detect some of the chemicals at levels as low as the screening level criteria, special analytical methods will be required. Full documentation of these analytical methods will be provided with the sample analyses.

Analytical results will be validated by CH2M HILL subcontractors approved by the Navy. Data validators will use EPA Region II guidance.

Field analyses used to assess hydrogeologic conditions will be performed according to standard operating procedures and results recorded in the field logbook. Results of field analyses will be evaluated by the field team leader.

During the RFI, CH2M HILL will collect a variety of environmental information which will support data analysis, reporting, and presentation activities. Environmental analytical samples and various types of field data will be collected during the investigation. These data will support subsequent data analysis for site characterization and reporting. The data will also support any subsequent remedial action decisions and the presentation of investigation results to the Navy, regulatory agencies, and the public. To meet quality assurance provisions of current regulatory requirements, a complete audit trail of the information flow will be established. Each step in the data management process (data collection, handling, control, storage, access, and analysis) will be adequately planned, executed, and documented. To meet this requirement, CH2M HILL will employ an environmental data management system (EDMS) that manages mission-critical information throughout the RFI process.

The EDMS will broadly support the collection and storage of analytical and field environmental data and project documentation in hard copy and electronic format; the analysis of data and the presentation of investigation findings using geographic information system (GIS) technology; and the access to environmental data and mapping

through Web-based interactive viewer tools that facilitate management review and decision-making processes.

2.3 Task AR—Assessment of Risks

Risk assessments will be conducted following all applicable guidance documents from EPA (federal and Region III). The following guidelines are a partial list of those to be used for the human health risk assessment:

- *Risk Assessment Guidance for Superfund, Volume 1, Human-Health Evaluation Manual, Part A, Interim Final* (EPA, 1989).
- *Risk Assessment Guidance for Superfund, Volume 1, Human-Health Evaluation Manual, Part D, Interim Final* (EPA, 1998).
- *Exposure Factors Handbook* (EPA, 1995).
- *Human-Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors* (EPA, 1991).
- *Risk-Assessment Guidance for Superfund, Volume 1, Human-Health Evaluation Manual, Part B* (EPA, 1991).
- *Dermal Exposure Assessment: Principles and Applications* (EPA, 1992).
- *Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening* (EPA Region III, 1993).

The ecological risk assessment will be performed according to the *Ecological Risk Assessment Guidance for Superfund (*EPA, 1997*). The Tri-Service Procedural Guidelines for Ecological Risk Assessments (*Wentsall, et al., 1996*)* also will be followed as appropriate. Quantitative assessments will be calculated for chemicals for which accepted toxicologic values exist. Other chemicals will be evaluated qualitatively.

2.4 Task RF—Phase I RCRA Facility Investigation Report

The results of the Phase I RFI will be documented in a report that will include, at a minimum, the following information:

- History and background of the area, including previous investigations
- Features and environmental setting
- RFI activities
- Sampling and analytical methods
- Presentation and evaluation of the analytical data
- Discussion of the nature and extent of contamination
- Results of the baseline human health and ecological risk assessments

In addition, the RFI report will include, as appropriate, site maps with sampling and monitoring locations, boring logs, geologic cross sections, validated analytical data, and figures depicting the nature and extent of contaminants at individual sites and the facility as a whole. In the event that a full RFI is deemed necessary, the full RFI will include the above referenced information with additional sampling data.

The RFI report will make recommendations concerning additional work and provide necessary support to justify the recommendations. The information collected and presented in the Phase I RFI report will be used in future studies that may include a full RFI and CMS. The Phase I RFI will follow EPA guidance titled *Interim Final RCRA Facility Investigation Guidance* (EPA 530/SW-89-031, May 1989).

A draft, draft final, and final RFI report will be prepared as part of this task. The draft final report will address any comments on the draft version and the final RFI report will address the regulators' and other relevant parties' comments on the draft final version.

2.5 Task CM—Corrective Measures Report

If a CMS is performed on a particular site, the results of the CMS will be documented in a corrective measures report. The report will include, at a minimum, the following information:

- Description and history
- Summary of the RFI and the impact on the selected corrective measure(s), including relevant field and laboratory studies
- Summary of corrective measure(s), including description; rationale; performance expectations; preliminary design criteria and rationale; general operation and maintenance requirements; and long-term monitoring requirements
- Design and implementation precautions of the corrective measure(s), including special technical problems; additional engineering data required; permits and regulatory requirements; access, easements, and rights-of-way; health and safety requirements; and community relations activities
- Cost estimates, including a capital cost estimate; operation and maintenance cost estimate; and present-worth analysis

Draft, draft final, and final versions of the corrective measures report will be prepared as part of this task. The draft final corrective measures report will address comments on the draft version, and the final corrective measures report will address the regulators' and other relevant parties' comments on the draft final version.

14.0 References

1) Test Methods for Evaluating Solid Waste, Physical/Chemical Properties, SW-846, Method 6200, Draft Revision, March 1996.

2) X-MET 920 User's Manual, Metorex.

3) X-MET 880 Field Portable X-Ray Fluorescence Operating Procedures, U.S. EPA Environmental Response Team, SOP # 1707, Rev. 0.0, December 1994.

4) McGraw Hill Encyclopedia of Science and Technology, X-ray Fluorescence Analysis, Volume 14, 1971.

5) Guidance for the Data Quality Objective Process, QA/G-4, EPA/600/R-96/055, September 1994.

6) Region I, EPA New England Quality Assurance Project Plan Guidance, Draft October 1996.

7) Guidance for the Preparation of Standard Operating Procedures for Quality-related Operations, QA/G-6, EPA/600/R-96/027, November 1995.

8) Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, July 1996.

9) Training Manual for Reviewing Laboratory Data Package Completeness, June 1994.

10) EPA Region I Performance Evaluation Program Guidance, July 1996.

11) U.S. EPA Code of Federal Regulations, 40 CFR, Part 136, Appendix B, Revised as of July 1995.

2.6 Task PP—Project Planning

Project management involves such activities as daily technical support and guidance; budget and schedule review and tracking; review of subcontractor invoices and client billings; personnel resources planning and allocation; subcontractor coordination; preparation for and attending meetings; preparation of monthly progress reports (MPRs); and communication and coordination of events. The project manager is responsible for all of these tasks. The project manager will review subcontractor invoices monthly and prepare MPRs monthly. The project manager will attend all key project meetings and prepare meeting summaries. The project manager will notify the EPA of any key technical changes or deviations from the work plan and any changes in key management staff assigned to the project.

SECTION 3

Schedule

Table 3-1 presents the schedule to perform the tasks for the Phase I RFI.

TABLE 3-1
Proposed Project Milestones

Phase I RCRA Facility Investigation, AFTWF
Vieques Island, Puerto Rico
2001

Key Project Milestones	End	Duration
Draft Site-Specific Work Plan		28 days
EPA Review		90 days
Final Site-Specific Work Plan		30 days
Conduct Field Investigation		30 days
Laboratory Analyses		30 days
Data Validation/Management		30 days
Data Evaluation		30 days
Draft Phase I RFI Report		30 days
Navy Review		90 days
Draft Final Phase I RFI Report		30 days
EPA Review		90 days
Final Phase I RFI Report		30 days

SECTION 4

Project Team

Project organization is depicted graphically in Figure 4-1. The CH2M HILL Project Manager designated for the oversight of this CTO is Mr. Marty Clasen. Mr. Clasen will have overall responsibility for such activities as technical support and oversight, budget and schedule review and tracking, review of invoices, personnel resources planning and allocation, and coordination. Mr. Erik Isern will serve as the field team leader for all work on the Phase I RFI. Mr. Isern will be responsible for providing technical support and oversight, personnel resources planning and allocation, and (in coordination with LANTDIV) he will assist the Project Manager in tracking the budget and schedule for the RFI activities and in preparing MPRs and reviewing invoices. In addition, Mr. Russ Bowen, Mr. Keith Coats, and Mr. John Tomik will provide senior review. Mr. Kevin Sanders will provide senior project chemistry support.

The RFI field program (soil sampling, well installation, etc.) will be performed by qualified CH2M HILL staff members. CH2M HILL will notify LANTDIV which CH2M HILL personnel will mobilize to the site prior to initiating field activities.

Resumes for the following individuals are included at the end of this plan:

- Mr. Russ Bowen
- Mr. Marty Clasen
- Mr. Keith Coats
- Mr. Eric Isern
- Mr. Kevin Sanders
- Mr. John Tomik

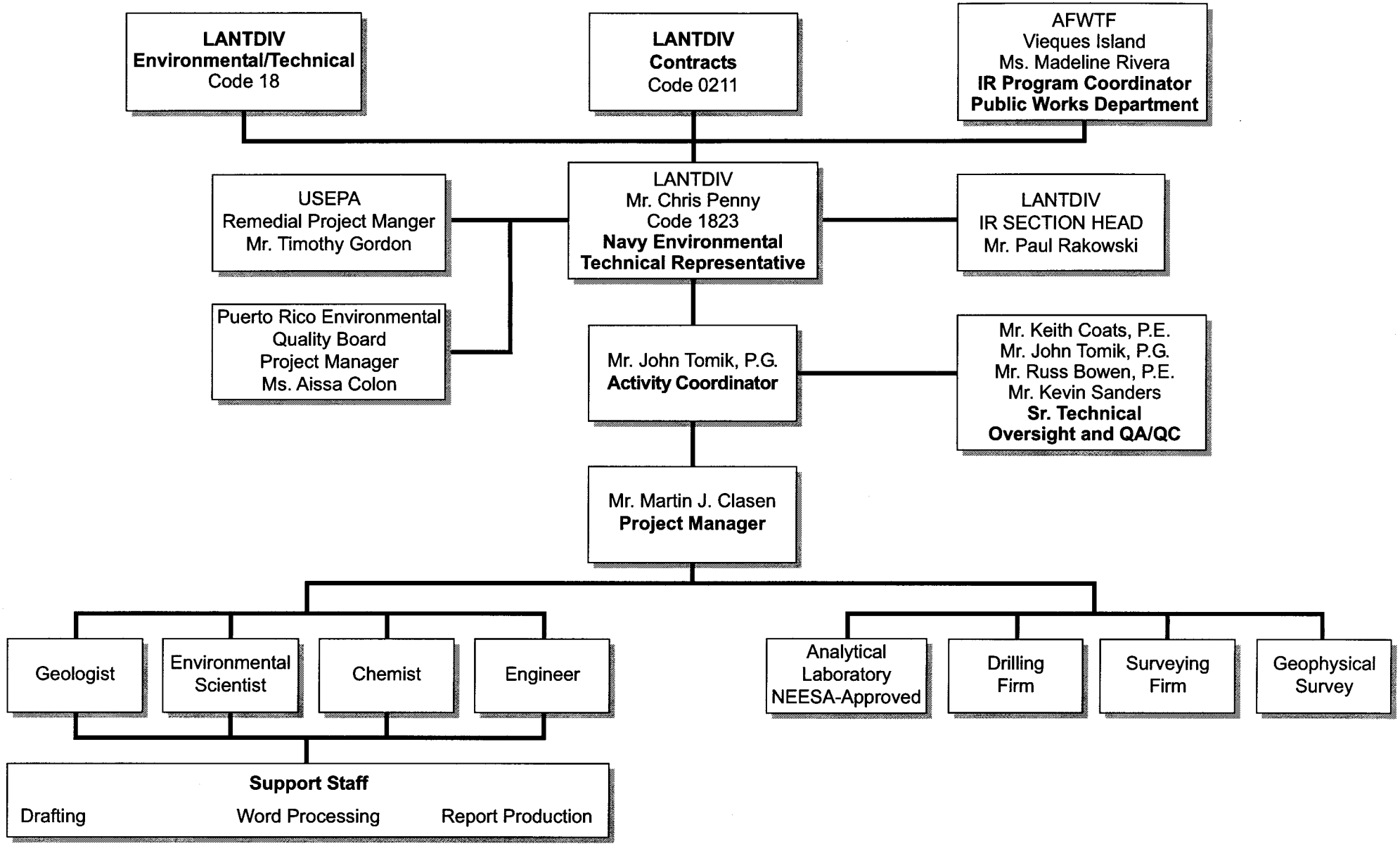

FIGURE 4-1
Project Organization
AFWTF Vieques Island, Puerto Rico

SECTION 5

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EPA. *Risk-Assessment Guidance for Superfund, Volume 1, Human-Health Evaluation Manual, Part B.* 1991.

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EPA Region II. Administrative Order on Consent. Docket RCRA 02-2000-7301. AFWTF, Vieques Island, Puerto Rico. January 20, 2000.

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I certify that the information contained in or accompanying this *Final Work Plan for the RCRA Facility Investigation,* Vieques Island, dated February 2001, is true, accurate, and complete.

As to the QAPP and SAP portions of this work plan for which I cannot personally verify accuracy, I certify under penalty of law that this work plan and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature: _____

Name: _____

Title: _____

Resumes

Russell V. Bowen, P.E.

Senior Environmental Engineer

Education

B.S., Civil Engineering - University of Florida
Associate Of Science - Canal Zone Jr. College

Professional Registrations

Professional Engineer: Florida and California

Distinguishing Qualifications

- Named in the BTI Consulting Group's "A-Team" listing of individuals recognized by environmental business clients for providing outstanding client service; Mr. Bowen is one of eight CH2M HILL staff named on this national A-Team list of just 73 professionals.

Relevant Experience

Mr. Bowen has 25 years of environmental engineering experience and specializes in environmental regulatory compliance and hazardous waste management, including environmental site assessments and permitting, environmental compliance audits, hazardous waste site investigations, and remedial action planning and design. He provides Program Management support for large environmental engineering contracts for the firm in the United States and throughout Latin America.

Representative Projects

Mr. Bowen has 25 years of environmental engineering experience and specializes in environmental regulatory compliance and hazardous waste management, including environmental site assessments and permitting, environmental compliance audits, hazardous waste site investigations, and remedial action planning and design. He provides Program Management support for large environmental engineering contracts for the firm in the United States and throughout Latin America.

Program Management

Mr. Bowen served as Program Manager for a $10 million Hazardous, Toxic, and Radioactive Waste (HTRW) Management Contract with the U. S. Army Corps of Engineers, Mobile District. This program included over 50 different delivery orders covering a wide variety of environmental compliance, environmental assessment, and engineering design projects with locations throughout the United States and Central America. In addition to providing overall direction of the program on contractual matters and project delivery, Mr. Bowen personally managed two major technical programs under the HTRW Contract: 1) the Environmental Compliance Assessment System (ECAS) program for the U.S. Army, and 2) the Department of Defense (DOD) Environmental Program of the Panama Canal Treaty Implementation Plan in the Republic of Panama.

The ECAS program involved the completion of comprehensive environmental and health and safety compliance assessments of regular Army and Army National Guard installations located throughout Florida, Puerto Rico, U.S. Virgin Islands, and the Republics of Panama and Honduras. Mr. Bowen directed multiple assessment teams to complete the assessments

at numerous installations concurrently over periods of several weeks, and participated in command-level briefings to present the assessment findings and alternative corrective actions for the findings. As follow-up corrective actions to the ECAS assessments, numerous compliance plans including Hazardous Waste Management Plans, Spill Prevention and Response Plans, Asbestos Program Management Plans, Stormwater Pollution Prevention Plans, and Solid Waste Management Plans were prepared for several installations.

The DOD Environmental Program of the Panama Canal Treaty Implementation Plan in the Republic of Panama included numerous investigations of potentially contaminated sites to document the environmental contamination of DOD-controlled property prior to its reversion to the Republic of Panama. Mr. Bowen directed the investigation of the sites, which included bulk fuel storage terminals, fueling stations, hazardous material/waste storage areas, and industrial activities. The program also included the design, fabrication, mobilization, and start-up of a mobile water treatment system used for the decontamination of water contained in bulk fuel storage terminals. This work was instrumental to the successful and timely reversion of the DOD-controlled property to the Republic of Panama in accordance with the provisions of the Panama Canal Treaty.

Mr. Bowen provides project delivery and staffing coordination for CH2M HILL environmental engineering projects in South America and the Caribbean. He ensures that proper project delivery procedures are implemented on a wide variety of projects including environmental assessments and permitting, environmental compliance assessments, wastewater treatment studies and design, and solid waste management.

Hazardous Waste Management

Mr. Bowen served as QA/QC Review Team Leader and Project Manager for the remedial site investigations at Patrick Air Force Base (AFB) and for underground storage tank closures and contamination assessments at Patrick AFB and Cape Canaveral Air Station (CCAS). This work was performed for the 45th Space Wing of the U.S. Air Force.

For the U.S. Army Toxic and Hazardous Materials Agency and the U.S. Naval Energy and Environmental Support Activity, Mr. Bowen performed preliminary hazardous waste assessments at 11 major Army and Navy installations to identify sites of potential contamination resulting from past waste management practices. He also assessed level of compliance with current environmental regulations.

For the U.S. Navy, Mr. Bowen managed the RI/FS of 36 sites of potential contamination at three naval installations in Puerto Rico and the Marine Corps Base, Camp Lejeune, North Carolina. A total of 102 groundwater monitor wells were installed, and investigations involved the sampling and analysis of soil, surface water, sediment, biota, and groundwater. Sites investigated included abandoned landfills, pesticide and PCB spills and leak sites, and underground storage tank facilities.

At Milan Army Ammunition Plant, Mr. Bowen managed the design of a multilayer cap system for the closure of 11 ammunition wastewater impoundments. He also managed the

design of initial remedial measures at the Sapp Battery Superfund site in north Florida. The project included a baseline risk assessment to develop response objectives and cleanup criteria for site remediation. The initial remedial measures developed for the site to eliminate imminent threats to human health and the environment consisted of the closure of a waste acid impoundment, removal of highly contaminated soil for offsite disposal at a secure landfill, and construction of a cap and stormwater controls.

Mr. Bowen's remediation design experience also includes the design of two groundwater collection and treatment systems at a bulk petroleum storage plant and a crude oil pipeline leak site. The groundwater collection systems consist of an infiltration trench and a multi-well extraction system. Both treatment systems consist of gravity oil/water separation, followed by granular activated carbon adsorption.

Environmental Compliance and Permitting

Mr. Bowen has managed Phase I/II environmental assessments and the development of permitting strategies for numerous facilities throughout South America in support of acquisitions and expansions of existing industrial facilities and construction of new facilities. Facilities assessed have included oil exploration and production fields, chemical production plants, automotive component manufacturing and assembly plants, power generation facilities, distilleries, and wineries.

In Bolivia, Mr. Bowen managed the development of an Environmental Impact Analysis (EIA) for the expansion of an existing thermoelectric power plant, which was approved upon initial review by the Ministry of Planning and Sustainable Development allowing the project to proceed on an aggressive schedule. The plant was successful in acquiring the operation permit for the facility based on the EIA.

In support of the privatization of the three largest commercial airports in Bolivia (Santa Cruz, Cochabamba, and La Paz), Mr. Bowen managed a comprehensive baseline assessment of the airport facilities and operations to identify existing environmental liabilities. The assessment involved a thorough environmental compliance assessment, as well as a detailed field investigation of potentially contaminated sites involving sampling and analysis of soil, surface water, groundwater, sediment, and building materials.

At Eglin AFB, the largest air base in the western world, Mr. Bowen managed the preparation of a comprehensive environmental compliance handbook to be used base-wide by all of the Unit Environmental Coordinators. The handbook covers all major areas of environmental compliance at the base, including the extensive natural resources management program.

Mr. Bowen also managed a corporate-wide environmental compliance audit for a confidential, multinational entertainment company in response to an Environmental Protection Agency (EPA) Administrative Order of Consent. The project required completion of comprehensive compliance audits of industrial and maintenance operations at 12

facilities throughout the United States. All work had to be accomplished within three months to ensure compliance with the Consent Order.

For a Fortune 500 household products manufacturing company, Mr. Bowen managed environmental compliance audits of three manufacturing plants of which the company was considering acquisition. This project involved an assessment of the environmental compliance of the facilities, as well as the development of cost estimates for the investigation and remediation of potential soil and groundwater contamination at the sites.

Mr. Bowen also completed the renewal of a Resource Conservation and Recovery Act (RCRA) Part B permit application for the Riverbank Army Ammunition Plant, Riverbank, California, and has served as engineer-of-record for RCRA Part B permits for five industrial facilities containing a variety of hazardous waste treatment and storage units.

Industrial Wastewater

Mr. Bowen served as lead engineer in the development of effluent guidelines and limitations for the timber products processing and wood preserving industries under contract to EPA. He directed sampling and analysis programs at numerous industrial wastewater treatment plants, and participated in the screening and evaluation of wastewater treatment technologies. Mr. Bowen also managed the development of Best Management Practices for management of sludge and stormwater for the wood preserving industry.

Martin J. Clasen, P.G.
Hydrogeologist

Education

M.S., Geology, University of South Florida
B.A., Geology, University of South Florida

Professional Registrations

Professional Geologist: Florida

Relevant Experience

Mr. Clasen is a project manager in the Environmental Business Group in CH2M HILL's Tampa office. As a professional geologist with more than 20 years of experience in the geosciences, Mr. Clasen has a wide range of expertise in various disciplines of geology including hydrogeology, deep well injection, ASR, groundwater supply wells, surface and borehole geophysics, groundwater modeling, environmental assessment, and remediation. Mr. Clasen has successfully managed projects for both public and private clients in various disciplines, including groundwater supply and environmental assessment and remediation.

Representative Projects

Mr. Clasen is currently the project manager of the Phase I RFI for 12 sites on the eastern end of Vieques Island, Puerto Rico. Additionally, he is project manager for an Expanded Preliminary Assessment/Site Investigation for 17 sites on the western end of Vieques Island.

Mr. Clasen successfully managed a $1.1 million dollar contamination assessment for the U.S. Navy in Puerto Rico. The project involves the environmental assessment of 15 underground storage tank sites including risk assessment and remedial design.

Mr. Clasen is the Project Hydrogeologist for the City of Tampa's Rome Avenue Park ASR Expansion site. He is responsible for coordinating permitting activities with the Florida Department of Environmental Protection and the Southwest Florida Water Management District. Mr. Clasen was responsible for preparing and presenting technical documents regarding groundwater modeling, well inventories, drilling and testing plans and mitigation plans. The objective of the project is to permit and install a 10 million gallon per day (mgd) ASR well field in an urban environment. The project offers unique challenges with a variety of stakeholders including the City of Tampa, regulatory agencies, and public groundwater users.

Mr. Clasen served as project manager for nine Site Investigations at Eglin Air Force Base in Florida. The project included coordination of sample collection and analysis, geophysical surveys, drilling, risk assessment, and report preparation.

Mr. Clasen is the project manager for a contamination assessment and remediation project at a metal manufacturing facility in Florida. The vertical extent of groundwater contamination was delineated in a highly fractured sinkhole-prone area. He conducted groundwater flow modeling to determine the effects of injecting treated water below the contaminant plume. The modeling supported the successful permitting of a Class V injection well. Capture zone modeling was also conducted to design a groundwater

recovery system in the center of the plume and a hydraulic barrier at the down gradient edge of the plume.

Mr. Clasen implemented a detailed contamination assessment plan at a battery recycling plant in Florida to determine the extent of lead contamination in the soils, surface water, stream sediments and groundwater. He conducted a time-series groundwater sampling test and hydrologic testing and soil and water sampling, analyzed the hydrologic and chemical data and prepared the Contamination Assessment Report.

Mr. Clasen was lead hydrogeologist for the DuPont Spruance Extraction System. He was responsible for installation and testing of 50 extracting wells and 25 performance monitoring wells. Supervised two hydrogeologists and three drilling crews.

As an independent geophysical contractor, Mr. Clasen conducted surface geophysical surveys to detect hydrocarbons, buried drums, hazardous waste, contaminant plumes, sinkholes, and fractures. He has experience with various geophysical techniques including ground penetrating radar, magnetometer, terrain conductivity, resistivity, spontaneous potential, gravity, and seismic refraction. Mr. Clasen possesses more than five years of drilling experience while employed as a geologist for two private minerals companies. Drilling methods included rotary, auger, reverse air, core, and sonic.

Mr. Clasen supervised the drilling, installation, and development of shallow and deep monitoring wells at MacDill Air Force Base, and was responsible for performing aquifer pumping tests and analyzing the test results. He also has conducted and supervised magnetometer, terrain conductivity, and ground penetrating radar surface geophysical surveys. Work included survey design, field collection of data, data reduction and interpretation, and final report preparation.

Mr. Clasen was lead hydrogeologist on a large data acquisition project at Robins Air Force Base with a very short time frame. All client-imposed deadlines were met. Tasks included developing drilling specifications for six deep, triple-cased monitoring wells, a Level B soil boring program, a shallow recovery well system, and a geophysical well logging program. The purpose of the deep monitoring wells was to determine if TCE had migrated down to a confining unit. Mr. Clasen supervised five drilling crews, conducted aquifer tests and geophysical logging, and prepared technical reports on the deep monitoring well construction and geophysical logging.

Mr. Clasen was project manager for the drilling and testing of four wells in the Northwest Hillsborough Water Resources Assessment Project for the Southwest Florida Water Management District. The project objectives were to determine the hydrogeologic properties of the Upper Floridan Aquifer, the depth of the saltwater interface, and the safe yield of the Upper Floridan Aquifer through a detailed hydrogeologic testing program that included geologic logging, large diameter coring, geophysical logging, water quality sampling, pumping tests, and packer tests. Mr. Clasen analyzed the data and prepared the final hydrogeologic report.

Martin J. Clasen

Mr. Clasen supervised a 72-hour aquifer pumping test of the reverse osmosis well field for the Englewood Water District in Florida. Responsible for completing an engineering report for the modification of a consumptive use permit. The report included aquifer test analysis, groundwater flow modeling, and geochemical data interpretation.

Mr. Clasen conducted detailed three-dimensional groundwater flow modeling to evaluate mounding effects from 85 rapid infiltration basins. He also calibrated the model with existing data and ran predictive models to support an increase on permitted infiltration rates.

Membership in Professional Organization

Association of Groundwater Scientists and Engineers (NWWA)
Ground Water Protection Council

Michael K. Coats, P.E.

Environmental Engineer

Education

B.S., Civil Engineering, University of South Florida
A.A., General Studies, Hillsborough Community College

Professional Registrations

Professional Engineer: Florida

Distinguishing Qualifications

- Project management, site characterization, and site remediation of Resource Conservation and Recovery Act (RCRA) corrective action projects
- Certified and experienced Level B, C, and D Site Safety Coordinator
- Extensive experience in RCRA and petroleum-related investigations and remediation
- Extensive experience in environmental assessments and audits

Relevant Experience

Regulatory Partnering

Mr. Coats is a member of the 45th Space Wing Remedial Project Manager Partnering Team for the Installation Restoration Program at Cape Canaveral Air Station and Patrick Air Force Base, Florida. Other members of the Team are 45th Space Wing project managers, the AFCEE Team Chief, representatives of US EPA Region IV, the Florida Department of Environmental Protection, and two other engineering contractors for the 45th Space Wing. The team is empowered to manage the RCRA Corrective Action Program at the 45th Space Wing and make collaborative decisions through a consensus drawing process. The sites being investigated and remediated are briefed during monthly Partnering Team meetings and decisions for further activities are discussed. Consensus from the Partnering Team for further activities allows fieldwork to proceed without the need for a formal approval process. The primary focus of the team is to closeout sites that present no unacceptable risks to human health and the environment and to focus funds and efforts to those sites that pose the greatest risks.

Environmental Compliance

Mr. Coats conducted environmental compliance audits of operation and maintenance activities for the United States (US) Air Force in Georgia; the US Army in Alabama and Panama; and US Army National Guard Facilities in Florida, Puerto Rico, and the U.S. Virgin Islands to assist these facilities in gaining compliance with federal, state, and local regulations. Findings of deficiencies were prepared which included recommendations for any needed corrective actions to ensure compliance with environmental laws and permits. The regulations addressed were related to waste management and pollution control, and included 16 different bodies of environmental regulations including: the Clean Air Act; Safe Drinking Water Act; RCRA Subtitle C (hazardous waste); RCRA Subtitle I (petroleum storage tanks); RCRA Subtitle D (solid waste); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Toxic Substance Control Act (TSCA); Federal

Insecticide, Fungicide, and Rodenticide Act; Historic Preservation and Cultural Resources; National Environmental Protection Act; Asbestos Abatement; Noise Abatement; Radon Abatement; Environmental Program Management; Hazardous Materials Management; and Community Affairs.

Mr. Coats conducted third party environmental assessments for a major oil company. The assessments focused on compliance with hazardous waste, air pollution, and wastewater discharge regulations and permit requirements. Also conducted several Phase I Environmental Assessments for property transactions. In addition to the due diligence requirements, these assessments involved the collection of groundwater and soil samples for laboratory analysis.

Mr. Coats conducted a right-of-way contamination screening evaluation for proposed interchange improvements at Interstate 4 and Osceola Parkway following Federal Department of Transportation guidelines. The purpose of the investigation was to identify, evaluate, and provide recommendations concerning potential project contamination problems within and/or adjacent to the existing right-of-way.

Environmental Permitting

Mr. Coats is currently the project manager for the preparation of a Findings of Suitability for Early Transfer (FOSET) and Covenant Deferral Request (CDR) documents in support of the US Navy's transfer of the Naval Ammunition Support Detachment property located on the Island of Vieques, Puerto Rico, to the municipality of Vieques.

Mr. Coats prepared hazardous waste and hazardous material Spill Prevention, Control, and Countermeasure (SPCC) Plans and Installation Spill Contingency Plans for the US Army National Guard Facilities in St. Thomas and St. Croix, US Virgin Islands. Assisted in the preparation of a SPCC plan for the Value Rent-A-Car facility located in Orlando, Florida, to cover maintenance operation at the facility.

Mr. Coats was lead engineer and project manager for the preparation of a Part B Permit Application for the closure of four RCRA 90-day hazardous waste storage facilities at Cape Canaveral Air Station and Patrick AFB.

Mr. Coats was project manager for the preparation of a Comprehensive Quality Assurance Program for the City of Lakeland Electric & Water Utilities Department for the City's environmental laboratory and field sampling programs

Resource Conservation and Recovery Act (RCRA)

Mr. Coats was project manager and lead engineer for a RCRA Facility Investigation (RFI), Corrective Measure Study (CMS), and Corrective Measure Implementation (CMI) of a large plume of chlorinated volatile organic compounds present under the industrial area of Patrick Air Force Base (PAFB), Florida.

Mr. Coats was project manager for a RFI/CMS conducted at a former pesticide storage and mixing facility at PAFB, FL. . An Interim Measure (IM) involving demotion of the former

pesticide building and removal or approximately 5,000 tons of pesticide contaminated soil was conducted to eliminate the threat to human health and the environment. The U.S. EPA and Florida Department of Environmental Protection agreed with the report recommendations that No Further Action is applicable for soil, and Long Term Monitoring is an applicable remedy for groundwater.

Mr. Coats was project manager for an RFI conducted to evaluate silver contamination in a drainage ditch at PAFB, FL resulting from incineration of photographic wastes in a nearby incinerator. Potential receptors at the site included ecological receptors. A Phase I and Phase II ecological risk assessment and toxicity study was conducted to evaluate the risk to these receptors. EPA and FDEP agreed with the RFI recommendations that NFA was applicable for the site.

Mr. Coats investigated Landfill 4 at Robins AFB in Warner Robins, Georgia, as part of a closure study conducted under Superfund. Fieldwork was conducted in level B health and safety personal protective equipment.

Mr. Coats worked on a variety of other RCRA projects as a supporting engineer for other project managers.

Toxic Substance Control Act (TSCA)

Mr. Coats was lead engineer for remediation of soil and concrete contaminated by polychlorinated biphenyls (PCBs) at two facilities on Eglin AFB, Florida and for the decontamination and closure of a waste oil tank containing PCBs at a scrap metal facility in Orlando, Florida. Responsible for: preparing technical specifications for remediation; contracting with remediation subcontractors; providing oversite of the remediations; and ensuring that the contaminated debris was manifested, transported, and disposed of in accordance with TSCA regulations. Also prepared IM reports that were incorporated into the RFI documents and assisted in preparation of the RFI documents.

Contamination Assessments and Remediation

Mr. Coats worked on a variety of petroleum-related and non-petroleum related contamination assessments and remedial actions over the past 10 years. Strong knowledge of the environmental regulations and good working relationships with environmental regulators has enabled Mr. Coats to perform contamination assessments and remedial actions using innovative technologies in order to avoid more lengthy and expensive remedial actions.

Unexploded Ordinance

Mr. Coats provided sampling support during the investigations of a live impact area at Camp Garcia, and at an open burning/detonation unit at the Naval Ammunition Support Detachment, both located on Vieques, Puerto Rico.

Industrial Experience

For Cargill Fertilizer in Tampa, Florida, Mr. Coats worked on closure plans for a gypsum stack including the design and construction of a drainage system to collect leachate after

closure; stormwater run-off management; and evaporation, percolation, and runoff testing. Mr. Coats also supervised and directed contractors during the construction of a 326-acre clay liner for a new gypsum stack, placement of high density polyethylene liners for acidic water ponds and acid tank diking, construction of concrete/bentonite slurry walls; closure of unlined acidic water ponds, and plant-wide paving for stormwater control. Mr. Coats also worked on the preliminary design of clay settling areas as part of Cargill's 20-year mine plan.

Design experience at Cargill included the pre-design of a maintenance shop, including a monorail system; the design of a heavy equipment washpad and sump; sampling dock for an environmental sampling station; stormwater collection sumps and pumping system; and pipeline protection for hazardous chemical piping.

Other projects include placement of high density polyethylene liners for acidic water ponds, and acid tank diking; plant-wide storm water management plan; construction of concrete/bentonite slurry walls; and closure of unlined acidic water ponds.

Publications

Physico-Chemical Processes for Removal of Metals from Groundwater. Presented at the 69th Annual Florida Water Resources Conference. Tampa, Florida. August 1994.

Erik Isern, E.I.T.

Environmental Engineer

Education

B.S., Mathematics, Interamerican University, Cupey, PR
B.S. Civil Engineering, Polytechnic University, Hato Rey, PR
Graduate Studies in Environmental Engineering, University of Michigan, Ann Arbor, MI

Professional Registrations

Engineer-in-Training

Project Experience

As an environmental engineer for CH 2M HILL, Erik is the field team leader and site safety coordinator for the site investigation activities in the Former NASD, Vieques, Puerto Rico, projects. He coordinates the field efforts and mobilization of personnel and equipment to and from Vieques. He is responsible for collecting environmental samples from different media including soil, sediment, and groundwater. He has served as the field superintendent for the Green Beach OE/UXO investigation. He has also provided support for projects in other military installations such Eglin AFB and Hurlburt Field, Florida. There, Erik was responsible for performing soil vapor extraction (SVE) respiration tests, groundwater sampling, and provided oversight for ORC and HRC injection into the contaminated subsurface soil matrix.

As environmental engineer with the CSA Group, San Juan, PR, in the Aquatic and Terrestrial Ecology Department, Erik's role was to provide support in the area of field data gathering, data analysis, and report writing as well as technical expertise from an engineering point of view. He coordinated environmental sampling of rivers and estuaries with environmental laboratories and prepared monthly and semiannual reports from those events as part of the water intake permits required by the EPA for the Puerto Rico Aqueduct and Sewer Authority. Erik was selected as team leader for sampling regional wastewater treatment plants as part of the 301 (h) Section of the Clean Water Act Waiver Demonstration for primary treatment plants discharging into the ocean via dispersion outfalls. As team leader, he was responsible for the WWTP sampling event including coordination with the plant supervisors, procurement of the equipment and manpower necessary to perform the sampling, and supervise the QA/QC of the sampling itself to assure that the procedures are carried out as established in the work plan. He also provided support in the packaging and handling of the samples that are shipped to various environmental laboratories.

As environmental engineer with CSA's Hydraulic and Hydrology Department, Erik became involved with H/H modeling of such projects as residential housing developments and watersheds. He was responsible for the verification of the computer-based models, Visual HEC, HEC-RAS, Pond Pack, etc., as applied to an area in both its undeveloped and developed stages. He also performed an analysis to specify whether retention or detention ponds were needed for runoff management within the development or project.

Other projects he was involved with were Rio Grande de Arecibo Watershed Management Plan, Lago Lucchetti Sanitary Survey, and groundwater well monitoring and sampling.

Erik Isern

As a project engineer for Warner Lambert, Inc., in Fajardo, PR, Erik was responsible for managing, coordinating, and motivating people to maintain high standards in project execution. He organized available people and methods to permit routine matters to proceed with minimum effort and delay while responding quickly and effectively to unusual or emergency needs. He directed all aspects of project execution required by the project scope including engineering, design, procurement, construction and facility start-up, and played a lead role in the proposal stage, served as the company's technical representative in contract negotiation, and in executing the projects as specified on time and within budget.

Erik was hired as a self-employed contractor for overseeing and supervising the demolition and decommissioning of hormone replacement treatment (HRT) contract manufacturing facilities in Humacao, PR, for a period of five weeks. Projects supervised ranged from small ($20K) to medium ($400K) and included the placement of sluice gates to regulate stormwater runoff as specified in the plant's spill prevention plan, cafeteria remodeling, and computer center remodeling.

For the National Center for Integrated Bioremediation Research and Development in Oscoda, MI, Erik worked as a research assistant. As part of a select group of graduate students from the University of Michigan's Environmental Engineering Department, he was involved with the characterization of a shallow, unconfined aquifer at Wurtsmith AFB, National Superfund Site. His responsibilities included sampling and analyzing PCE- and TCE-contaminated groundwater from monitoring wells using state-of-the-art methods and equipment. Some of these methods were being developed onsite as part of the technology development program. He formed part of the team dedicated to establishing SOPs for the field equipment used such as field GCs, PID, FID, ion probe, and fluorometer. These SOPs would serve as field guides for use by future university personnel and technicians. Because of his civil engineering background, he was chosen to provide a topographic representation of the field site that included level measurements of the grid work where underground bioremediation test lanes were laid out.

Erik worked as Civil/Environmental Engineer for CMA Architects & Engineers, San Juan, PR. He was responsible for environmental permitting of construction projects, building use, and air quality permits. He was a key player in the coordination with the Environmental Quality Board, Planning Board, and U.S. Corps of Engineers. He assisted in preparing environmental assessments and environmental impact statements. He supervised a team of 10 college summer interns. He coordinated the Statewide Transportation Study with PRHTA and DTPW in accordance with ISTEA requirements for municipal and state governments.

Erik worked as a public assistance engineer for the Office of the Governor’s Authorized Representative for FEMA, San Juan, Puerto Rico. He was responsible for performing final inspections and field reports of Federal-aid disaster projects in preparation for their closure as per FEMA guidelines. He routinely inspected highways and bridges after reconstruction and certified them for completeness. He served as liaison between local, state, and Federal

governments. He provided technical assistance to the local governments agencies and organizations.

As a public assistance engineer for the Federal Emergency Management Agency in San Juan, PR, Erik was responsible for damage assessments and providing field reports of Nationally declared disasters including the Three King's Flood in 1992 (PR) and older disasters in PR, USVI, and others within the FEMA Region II jurisdiction. He performed damage assessment of infrastructure projects including highways, bridges, culverts, retaining walls, and pipe systems. He provided cost estimates for restoration to pre-disaster conditions of public buildings, bridges, and roads. He was also involved in training county and local government emergency-management employees in all aspects of FEMA participation. Topics covered in the training sessions were eligibility, classification of small and large projects, and closure of projects and applicants.

He was Mathematics Professor at the Polytechnic University of Puerto Rico, Hato Rey, PR. He was responsible for preparing and teaching college-level mathematics courses to entering freshmen. These courses included elementary algebra, trigonometry, and pre-calculus.

For GEO CIM, Inc., in San Juan, Puerto Rico, Erik was responsible for conducting sieve analyses, penetrometer tests, Atterberg limits, and concrete strength testing on concrete samples obtained at the various construction sites. He performed quarterly monitoring of wells near fuel tanks in gas stations for detection of possible leaks.

John C. Tomik, P.G.

Project Manager

Education

M.S., Geology, State University of New York at Fredonia
B.A., State University of New York at Oneonta

Professional Registrations

Certified Professional Geologist, AIPG #7625
Certified Professional Geologist, VA #2801000999

Distinguishing Qualifications

- Experienced in environmental site assessments

Relevant Experience

Mr. Tomik's areas of expertise include environmental site assessments, hydrogeologic investigations, hazardous waste management, soil and ground water remediation, solid waste management, and ground water supply development.

Mr. Tomik has published papers on site assessments and remediation, as well as participated in several environmental seminars. He has co-authored chapters of two textbooks on hazardous waste management. Also, he has served as an expert witness for legal firms on behalf of several industrial clients.

Hazardous Waste

Project Manager for a soils and groundwater investigation to assess the nature and extent of an organic contaminant plume for AlliedSignal, Hopewell, Virginia. Project included the collection of Geoprobe soil samples, the installation of groundwater monitoring wells, soil and groundwater analyses, and mapping of groundwater flow and contaminant plume.

Project Manager for several indefinite delivery contracts that included: RCRA Facility Investigations and Corrective Measure Studies, Corrective Measure Implementations, RCRA closures, site checks, UST site characterizations, assessments, corrective action plans, and contaminated groundwater studies at more than 20 U.S. Navy facilities in Virginia (Norfolk, Yorktown, Craney Island, Oceana, Little Creek), North Carolina (Camp Lejeune, Cherry Point) and Cuba (Puerto and Guantanamo Bay). Activities included site investigations, aquifer pumping tests, ground water flow modeling, delineation of contaminant plumes, corrective action plans, design of ground water remediation systems.

Project Manager for a RCRA groundwater investigation to evaluate the extent of soil and ground water quality impacts from VOCs, PCBs, semi-volatile compounds and metals for BASF Corporation in Williamsburg, Virginia. Managed a soil and ground water remediation project under the Virginia Voluntary Remediation Program that included air sparging/vapor extraction.

Project Manager for RCRA closure of hazardous waste management storage area for NORSHIPCO, Norfolk, Virginia. Managed a $600,000 site assessment and remediation program in accordance with the Virginia Remediation Program Guidelines to mitigate areas contaminated with PCBs, PAHs, TPH, heavy metals, and asbestos.

John C. Tomik

Project Manager for a RCRA Post-Closure Monitoring Program and RCRA Corrective Action Plan for the Newport News Shipyard, Newport News, Virginia, from two former surface impoundments containing VOCs, PCBs, metals, and TPH. Developed first industrial risk-based RCRA closure approved by Virginia DEQ.

Developed approach with Cooper Industries, Charlottesville, Virginia, for RCRA Permit Modification to obtain risk-based accelerated termination of ground water remediation system.

Project Manager for risk-based RCRA closure of two metal plating facilities for the Navy.

Project Manager for a ground water monitoring program at the Hoechst Celanese Corporation industrial complex in Portsmouth, Virginia, to assess impacts from VOCs, pesticides, metals and PCBs.

Project Manager for ground water monitoring and vapor monitoring program to assess impacts from three AST facilities for Philip Morris, Richmond, Virginia.

CERCLA

Managed the following Superfund programs that included Remedial Investigations and Feasibility Studies (RI/FS), Work Plans, QAPPs, Health and Safety Plans, and Risk Assessments

Site	Location	Services
First Piedmont Rock Quarry	Danville, VA	Predesign investigation, Remedial Design
Culpeper Wood Preservers	Culpeper, VA	Work Plan Negotiations
Richardson Hill Road Landfill	Sidney, NY	RI/FS, Interim Remedial Design
Ludlow Sand and Gravel	Clayville, NY	RI/FS
Conklin Dumps	Conklin, NY	RI/FS
GE Moreau	Glen Falls, NY	Site Investigations
Barkhemsted Landfill	Barkhemsted, MA	RI/FS, Interim Remedial Measures
Baird & McGuire	Braintree, MA	Site Investigation, EPA Oversight
Pollution Abatement Svcs.	Oswego, NY	Site Investigations , Interim Remedial Measures
Dorney Road Landfill	Reading, Pa	Remedial Design
Spiegelberg Landfill	Detroit, MI	Site Investigations
TRW, Inc. Minerva Plant	Minerva, OH	Remedial Design, Post Closure Monitoring
Neals Landfill, Neals Dump	Spencer, IN	Site Investigations
Lemon Lane Landfill	Bloomington, IN	Site Investigations

Managed several projects associated with the development of soil and ground water remedial programs. Services included: site investigations, ground modeling to assess well capture zones and to evaluate cleanup levels, and preparation of remediation system plans and specifications.

John C. Tomik

Site	Contaminants	Remedial Program
U.S. Navy, Norfolk, VA		
Oceana, Virginia Beach, VA	VOCs, TPH, SVOCs, LNAPL	Bioventing, trench recovery system, oil/water separation
Camp Lejeune, NC (3 sites)	VOCs, TPH, LNAPL	Oil/water separation, air stripper treatment
Bousch Creek, Norfolk, VA	LNAPL, VOCs	Oil/water separation, air stripper treatment
Little Creek, VA	LNAPL, VOCs, SVOCs	Oil/water separation, carbon treatment
Craney Island, VA	LNAPL, VOCs	Oil water separation
Auburn, NY	VOCs	*Ex situ* aeration of soils
Lebanon, TN	VOCs	*Ex situ* aeration of soils; air stripper, ground water remediation
BASF Corp., Williamsburg, VA	VOCs	Vacuum extraction of soils, air sparging of ground water
IBM, Owego, NY	VOCs	Air stripper, ground water treatment

Project Manager for a site characterization and risk assessment for the former Boiler Cleaning and Specialty Corporation, Norfolk, Virginia. This project was completed in accordance with Virginia Voluntary Remediation Program Risk Assessment Guidelines. A quantitative risk assessment demonstrated that elevated levels of VOCs and SVOCs could remain onsite.

Project Manager for a risk-based closure of a RCRA hazardous materials storage facility for Newport News Shipbuilding, Newport News, Virginia. The risk-based closure was the first industrial risk-based closure approved by VDEQ in Virginia.

Project Manager for a site characterization and risk assessment for Southland Industries in Chesapeake, Virginia, which is completed under the risk assessment guidance of the Voluntary Remediation Program.

Project Manager for a site characterization/remedial action program for the BASF Corporation in Williamsburg, Virginia, which is ongoing under the Virginia Voluntary Remediation Program. Responsible for the design, installation, and operation of an air sparing/vapor extraction system to remove VOC concentrations within the ground water to risk-based levels.

Project Manager for a risk-based closure of the St. Helena Annex property for NORSHIPCO, Norfolk, Virginia. A site characterization was completed to delineate the extent of contamination in accordance with the Virginia Voluntary Remediation risk-based criteria. A remedial action plan was designed and implemented, that included the excavation of petroleum and PCB-contaminated soils in excess of the VRP risk-based criteria.

Project Manager for a risk-based closure of two RCRA metal plating facilities for the U.S. Navy, Norfolk, Virginia. Site characterization was completed to delineate the extent of metals, VOCs, and SVOCs within the soils. A quantitative risk assessment was conducted in accordance with EPA risk assessment guidance to delineate the extent of contaminated areas that would require remediation above risk-based cleanup levels.

Environmental Compliance

Task Order Manager for an Oil Spill Prevention and Response Plan for the St. Juliens Creek Annex of the Norfolk Naval Shipyard in Chesapeake, Virginia. The plan was an integrated

spill plan that met the requirements for SPCC Plans, Virginia ODCP, and Coast Guard Facility Response Plans (FRP). Plans were prepared for twelve activities at the Norfolk Naval Base and ten facilities at St. Juliens Creek Annex. The plan also included drills and an exercise to meet the PREP Guidelines.

Project Manager for an Oil Spill Prevention and Response Plan for the NORSHIPCO Shipyard located in Norfolk, Virginia. The plan combined the requirements of the facilities SPCC Plan, FRP, and Oil Discharge Contingency Plan (ODCP) into one comprehensive plan. The plan addressed spill prevention for over fifty above ground storage tanks, and included site plans showing locations of ASTs and drills and an exercise to meet the PREP Guidelines.

Program Manager for a multi-task order IDC for the U.S. Navy LANTDIV UST/AST Management Program. Tasks included UST/AST site assessments, site checks, site characterizations, corrective action plans, design plans, and specifications for remediation systems. Tasks were completed at over twenty US Naval facilities located in Virginia, North Carolina, Puerto Rico, and Cuba.

Task Order Manager for a multi-task order IDC for the US Navy Public Works Center in Norfolk, Virginia. Tasks included: SPCC Plans, UST Site Characterizations, RCRA Risk-based Closures, and Corrective Action Plans. Work tasks were completed at over eighty sites at Naval Base Norfolk, NAS Oceana, Fentress Field, NAB Little Creek, Dam Neck, Norfolk Naval Shipyard, St. Juliens Creek Annex, Portsmouth Naval Hospital.

Project Manager for a Stormwater Prevention Plan at the BASF Corporation in Williamsburg, Virginia. The Plan addressed Spill Prevention and several onsite facilities including: above ground storage tanks, USTs, a wastewater treatment plant, and an onsite landfill.

Program Manager for an Environmental Compliance Audit at Marine Hydraulics in Norfolk, Virginia. Evaluated compliance with regulatory programs such as SPCC Plan, Storm Water Permit requirements, Sewage System Discharge Permit, and AST Regulations.

Program Manager for the AST Compliance Program for Philip Morris in Richmond, Virginia. Evaluated compliance with Oil Discharge Contingency Plan (ODCP) requirements at three manufacturing facilities in the Richmond area. In addition, conducted well installation monitoring, vapor monitoring, and free product assessments.

Water Supply Development

Managed a countywide ground water supply study for Stafford County, Virginia, to assess long-term water availability. Test wells were installed and aquifer pumping tests completed to estimate the safe yield of the aquifer.

John C. Tomik

Conducted regional assessment of soil, geologic, and ground water conditions for Rivanna Water and Sewer Authority, Charlottesville, Virginia, to assess the feasibility of developing a ground water supply system.

Investigated the long-term safe yield of existing ground water supply system and design of system expansion to maximize the use of available ground water supply for the Latham Water District, Town of Colonie, New York. Conducted aquifer performance testing, ground water flow modeling, hydrogeologic investigation, and design and installation of additional supply well, with expanded system safe yield determined to be 9.5 mgd.

Conducted hydrogeologic investigations in Boonville, New York, to identify potential well sites, aquifer safe yield, and wellhead protection areas; final design plans, and specifications for municipal supply wells, with capacity of 1.0 mgd water supply.

Conducted hydrogeologic investigations to select well site and design specifications for production well in Conklin, New York.

Performed data review to identify potential well sites, installation of test wells, and design specifications for proposed municipal supply well for Village of Marathon, New York.

Performed data review to select potential well sites, drilling, and design specifications for two water supply systems used to bottle spring water in the Adirondack Region of New York.

Responsible for soil test drilling program, test wells installation, aquifer performance test, and design specifications for the final municipal supply well for Borough of Oakland, Pennsylvania.

Responsible for ground water management studies including mapping of countywide hydrogeologic conditions, defining extent of major aquifers, evaluating availability of ground water supplies, identifying existing and potential sources of contamination, and evaluating management alternatives for Cortland and Oswego Counties, New York.

Responsible for ground water management study of the Brooklyn and Queens section of the Long Island Aquifer, including characterization of aquifer conditions, evaluation of existing and potential for salt water intrusion, assessment of flooding, evaluation of ground water modeling, and development of water supply management alternatives.

Professional Memberships

National Ground Water Association

delegated projects to appropriate personnel, interacted with clients and regulatory agencies, and prepared or coordinated preparation of client reports. He reviewed all analytical work for integrity of data and compliance with contract and quality standards and offered technical expertise for solving technical problems. He supervised four cations analysts and two digestion technicians. In addition, he coordinated instrument maintenance and trained chemists and technicians.

Mr. Sanders served as project chemist for 3M-Guin in Montgomery, Alabama. He reviewed the SAP and QAPP and chose applicable analytical methodologies for the project, coordinated laboratory work, validated the data, and prepared the technical memorandum.

He served as project chemist/consultant for Passaic Valley (New Jersey) Sewerage Commission. For this project, he audited the laboratory chosen to provide analytical services and made recommendations regarding its capabilities and procedures, consulted in a technical capacity as an atomic spectroscopist, and reviewed and validated the data.

Mr. Sanders served as consultant to Boston Harbor, in which capacity he reviewed analytical data and made recommendations pertaining to atomic spectroscopy and limnology.

For Atlantic Electric in Philadelphia, Pennsylvania, Mr. Sanders was project chemist/consultant and provided services pertaining to analytical methodologies and data interpretation. He coordinated work and methods for other labs involved in the project.

For the EPRI PISCES project, he was project chemist and primary consultant for clean sampling and analytical techniques. He also served as laboratory auditor and data quality evaluator.

Mr. Sanders was lead radiological data validator for Fernald DOE in Columbus, Ohio. For this project, he validated radionuclide data for gamma-, beta-, and alpha-emitting elements. He served as the lead reviewer for other validators, consulted as an inorganic lead validator, and was task manager for the local validation task.

On a project for Kerr-McGee-West Chicago, he reviewed the QAPP, prepared data validation guidance documents, and validated radiological data.

Mr. Sanders was data validator and data quality evaluator on projects for the following Air Force bases: Arnold, Kelly, Robins, Travis, Lackland, Eglin, Hurlburt, Patrick, and Wright Patterson. He performed inorganic, organic, and radiological data validation for these projects. He authored many of the data quality evaluation technical reports for these bases.

As data validator for THAN, Mr. Sanders validated inorganic data for the project and authored that portion of the technical memorandum.

As consulting chemist for the Seal Beach Naval Weapons Depot, he set up the project's CSL.

As data validator and data quality evaluator for NASA MSFC, Mr. Sanders performed inorganic and organic data validation for these projects. He also authored the data quality evaluation technical report.

Kevin A. Sanders

Mr. Sanders served as data validator and data quality evaluator for Camp Robinson, Arkansas. He audited the subcontracted laboratory and served as its spectroscopy consultant to ensure contract compliance and data viability. He was data validation task manager and lead inorganic data validator for the project team. He wrote the organic functional validation guidelines modified to reflect SW-846 methods.

As consulting chemist to Georgia-Pacific, Mr. Sanders provided laboratory audit and method review expertise for a Georgia-Pacific plant laboratory.

Before joining CH2M HILL, Mr. Sanders worked as atomic spectroscopy supervisor at an environmental laboratory in Texas. His principal responsibilities were the supervision and performance of preparation, digestion, and analyses of liquid and solid wastes and extraction procedure leachates by FLAA, GFAA, and ICPOe spectroscopy.

Also in another position, he gained experience as a lead analyst and environmental biologist, with expertise in inorganic analysis of wastes by potentiometric, titrimetric, gravimetric, and colorimetric methodologies. He performed field limnology studies and evaluations, including effects of biological control agents, nonpoint source pollution and storm runoff, sediment characterization, primary productivity and nutrient cycling, algal growth dynamics, macrophyte removal and treatment, inorganic carbon dynamics and pH, teleost species distribution, fish kill investigations, and limnological physical parameters.

Mr. Sanders has also worked as a water plant operator and lead analyst for a utilities company in Texas. His responsibilities included analyzing environmental effluents, feedwater, and boiler water by classical wet chemistry techniques. He also operated and maintained demineralized water plants, drinking water plants, and sewage treatment plants. He installed, calibrated, and maintained chemical monitoring equipment and electronic and pneumatic control instrumentation.

Memberships in Professional Organizations

Society for Applied Spectroscopy

Honors and Awards

Graduated Magna Cum Laude

Graduated with honors in Environmental Science (Limnology)

Golden Key National Honor Society

Alpha Chi National Honor Scholarship Society (Texas Omicron Chapter)

National Dean's List

Army Good Conduct and Army Commendation Medals

Arizona State University "Order of the Mist" recipient

Kevin A. Sanders

Publications and Presentations

Changes in the Inorganic Carbon Dynamics of Lewis Creek Reservoir After Biological Control of Hydrilla by the White Amur (Honors Thesis). Presented to Gulf States Utilities Company, Willis, Texas. December 1986.

Characterization of Stormwater Run-off. Presented to Louisiana Pacific Corporation, New Waverly, Texas. May 1987.

Characterization of Treatment Lagoon Sediments. Presented to Louisiana Pacific Corporation, New Waverly, Texas. May 1987.

Kevin A. Sanders
Senior Environmental Scientist

Education

B.S., Environmental Science, Sam Houston State University
Associate of Science, Danville Area Community College

Distinguishing Qualifications

- Over 18 years of experience in the environmental laboratory business
- Over 12 years of experience as a laboratory supervisor/manager
- Over 6 years of experience as project chemist for a variety of projects
- Over 9 years of experience in the laboratory aspects of water and wastewater treatment plants
- Over 6 years of experience in the validation of radiological, inorganic, and organic laboratory data
- Over 9 years of experience as a consultant in the field of atomic spectroscopy

Relevant Experience

As a senior consulting chemist, Mr. Sanders prepares proposals and manages, organizes, and performs data validation and data quality evaluation tasks for projects that include inorganic, radiological, and organic chemistry results. Additionally, he prepares and reviews quality assurance project plans (QAPPs) and designs, sets up, and staffs field close support laboratories (CSLs). Mr. Sanders provides consulting services for projects in the environmental chemistry discipline, performs audits of analytical laboratories and procures laboratory services, serving as liaison between project management and contract laboratories. He provides technical expertise and consulting services in the fields of quality assurance, limnology and ichthyology, atomic spectroscopy (metals), and general inorganics. He also specifies and recommends analytical equipment for laboratory operations and appropriate methods for project DQO's.

As the former laboratory director of the Corvallis Applied Sciences Laboratory, which had over $2.5 million in annual revenue, Mr. Sanders administered the operational and financial aspects of all sections within the laboratory. Additionally, he served as a senior consulting chemist to internal and external projects, specializing in atomic spectroscopy applications. Mr. Sanders also served as a lead radiological, organic, and inorganic data validator.

- Inorganic division manager for CH2M HILL, responsible for coordinating all functions of the Wet Chemistry and Cations sections. He was responsible for the technical direction, quality, financial, and personnel management of the division. Mr. Sanders also served as the laboratory inorganic spectroscopist and as project manager for specific laboratory/engineering projects.
- Cations supervisor for CH2M HILL, responsible for coordinating and executing all areas of spectroscopic determinations by AA, ICP, and cold vapor, and ensuring staff effectiveness and adherence to quality and throughput goals. He scheduled all tasks,